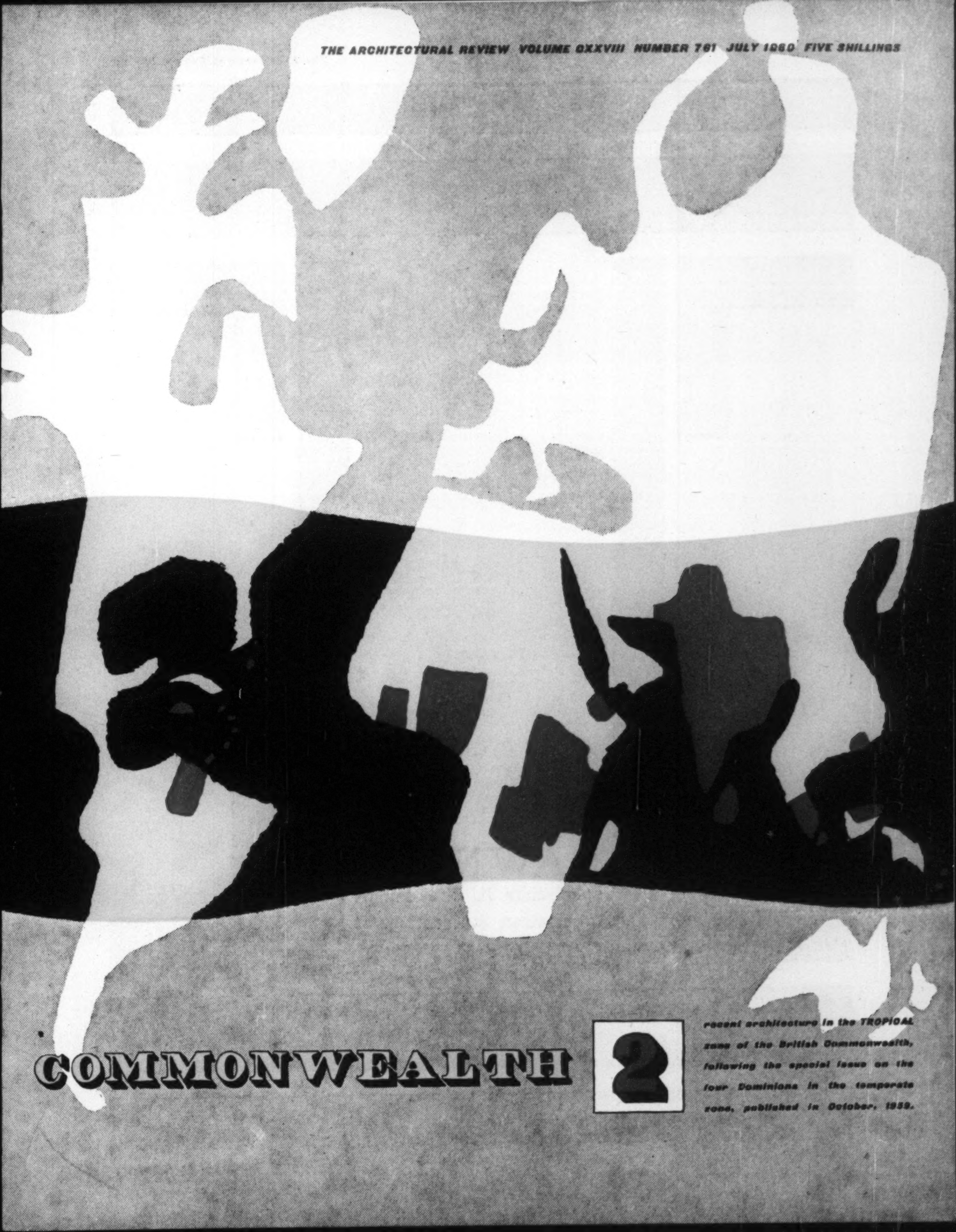
THE ARCHITECTURAL REVIEW VOLUME CXXVIII NUMBER 761 JULY 1960 FIVE SHILLINGS



COMMONWEALTH 2

recent architecture in the TROPICAL zone of the British Commonwealth, following the special issue on the four Dominions in the temperate zone, published in October, 1959.

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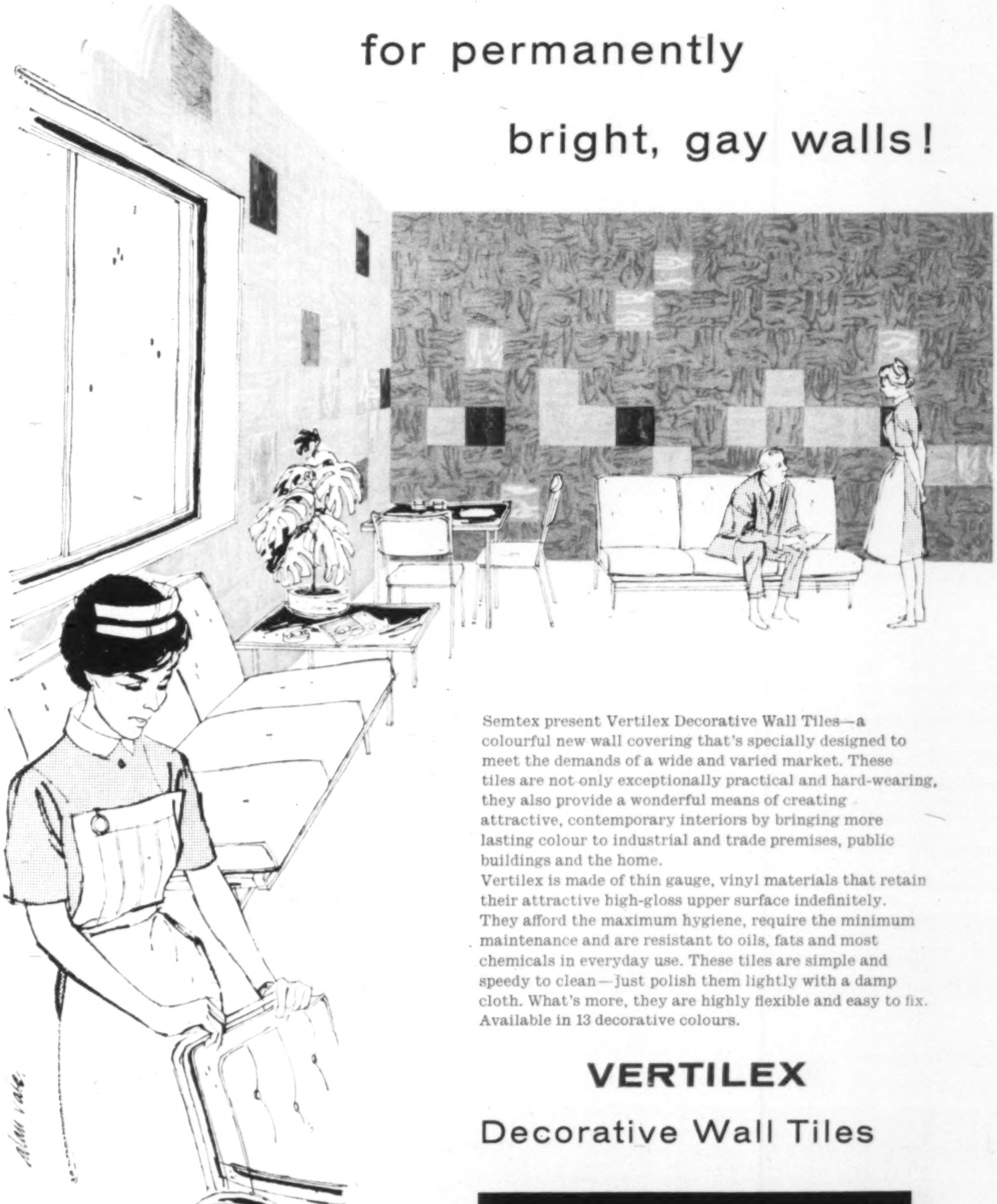

Semtex present Vertilex Decorative Wall Tiles—a colourful new wall covering that's specially designed to meet the demands of a wide and varied market. These tiles are not only exceptionally practical and hard-wearing, they also provide a wonderful means of creating attractive, contemporary interiors by bringing more lasting colour to industrial and trade premises, public buildings and the home.
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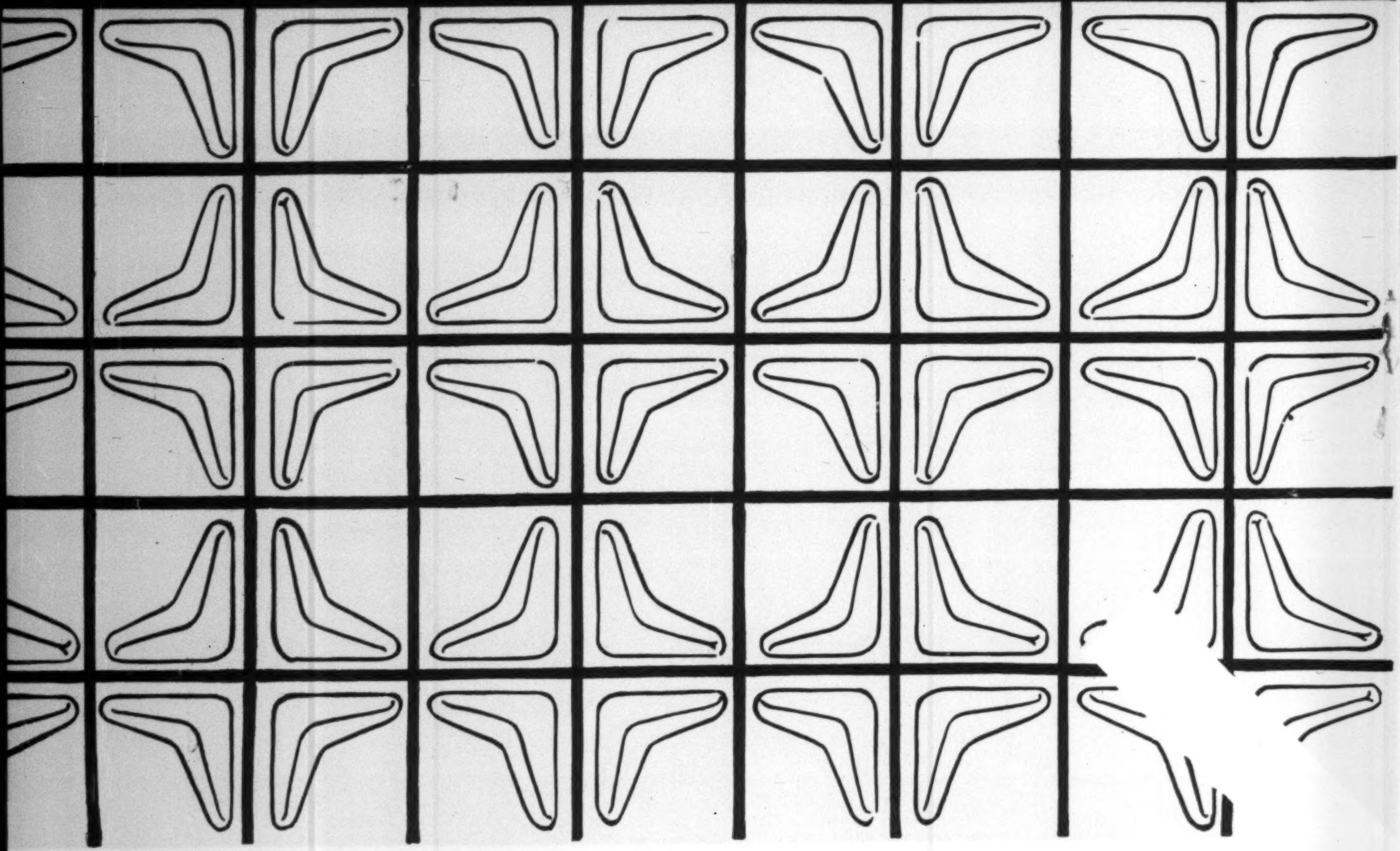
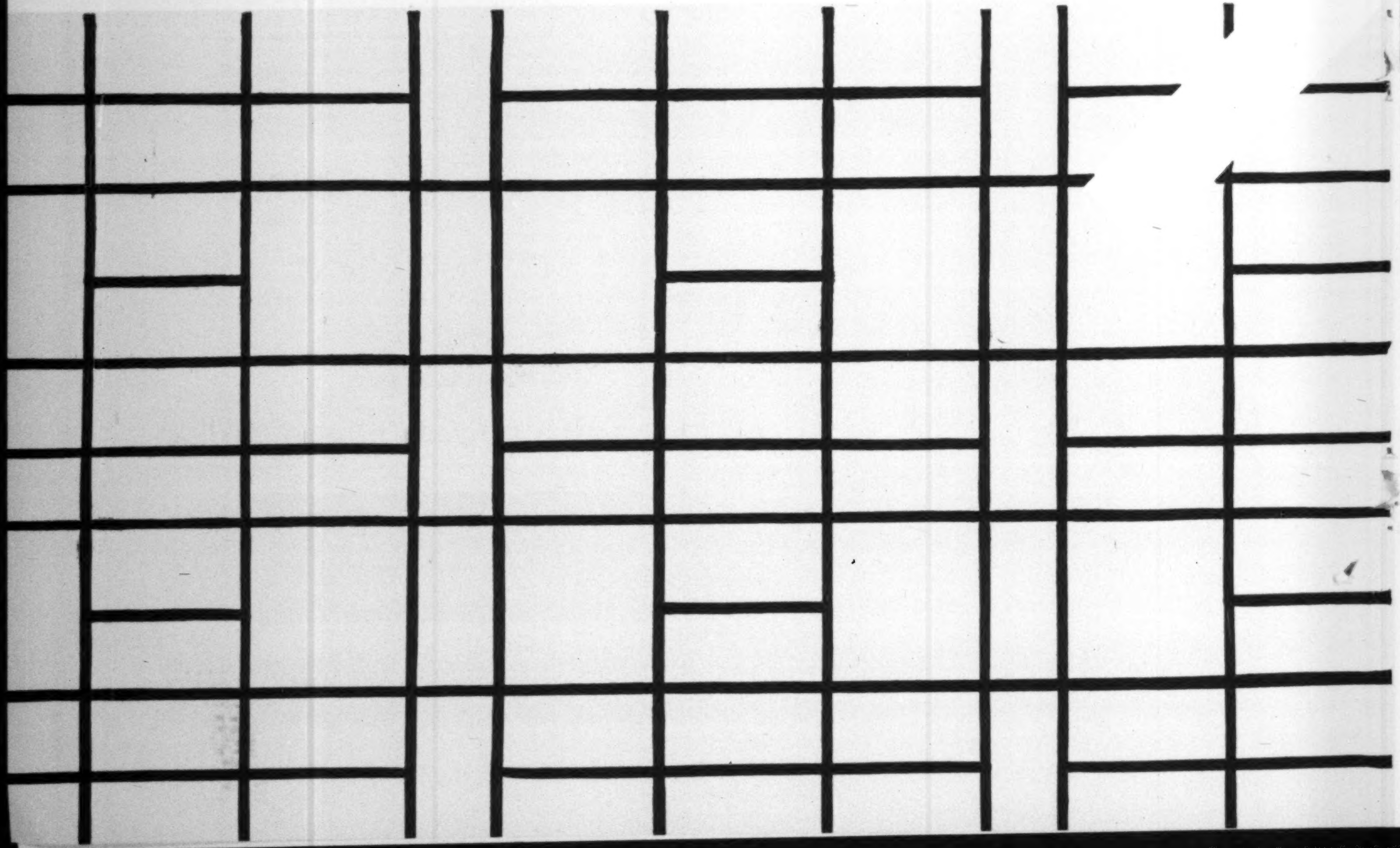


Walls of light come to life with 5 new 'Insulight'



Now the modern designer can use Pilkingtons' 'INSULIGHT' Hollow Glass Blocks to build walls of light which add as much to the appearance of a building as they add to its efficiency. New 'INSULIGHT' Hollow Glass Blocks provide the elements for an unlimited variety of design patterns and, of course, these new blocks retain all the well-tried benefits of heat and sound insulation; deep light penetration; easily cleaned hygienic surfaces; fire resistance.

For full details of 'INSULIGHT' Hollow Glass Blocks in both standard and new types, write to the manufacturers, Pilkington Brothers Limited.

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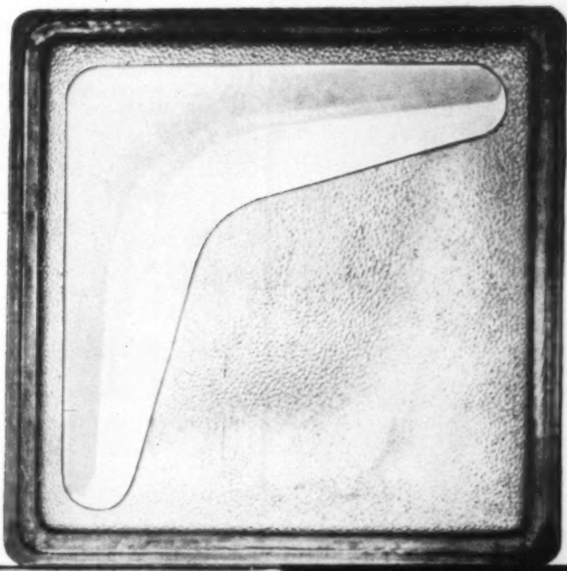
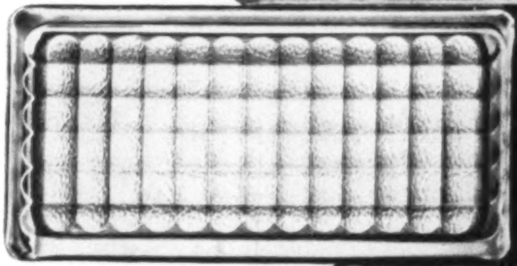
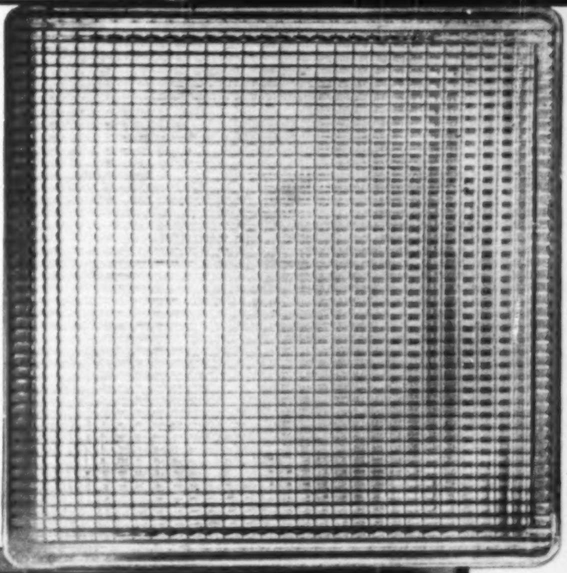
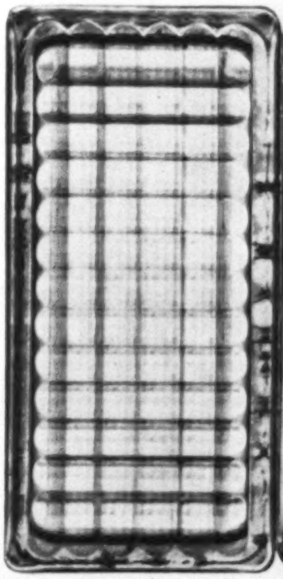

PB6


PB32

the 5 new patterns


PB4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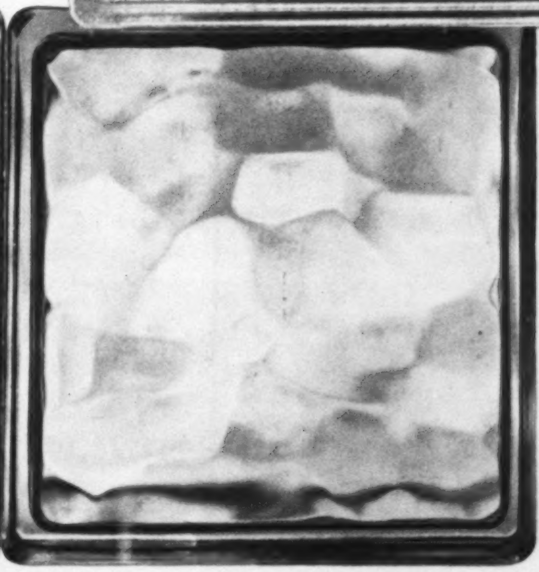
PB5

Hollow Glass Blocks

P.B.32 HALF SIZE BLOCK—CROSS REEDED
The new P.B.32 Half Size Block (in both standard and light diffusing patterns) can be fixed in various combinations, horizontally and vertically with full size blocks. Size: 7¾″ x 3¾″ x 3⅞″ thick.

P.B.5 FLEMISH The outside faces are smooth; the internal surfaces incorporate a 'Large Flemish' pattern. Size: 7¾″ x 7¾″ x 3⅞″ thick.

P.B.6 BOOMERANG A clear glass 'boomerang' shape stands out in relief on each of the outer faces. Capable of being built into many designs, one of which is shown opposite. Size: 7¾″ x 7¾″ x 3⅞″ thick.

P.B.4 PRISMATIC This Block combines all the advantages of Hollow Glass Blocks and Prismatic Glass. Light is refracted, reflected and uniform. Size: 7¾″ x 7¾″ x 3⅞″ thick.

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'INSULIGHT' is the registered trade mark
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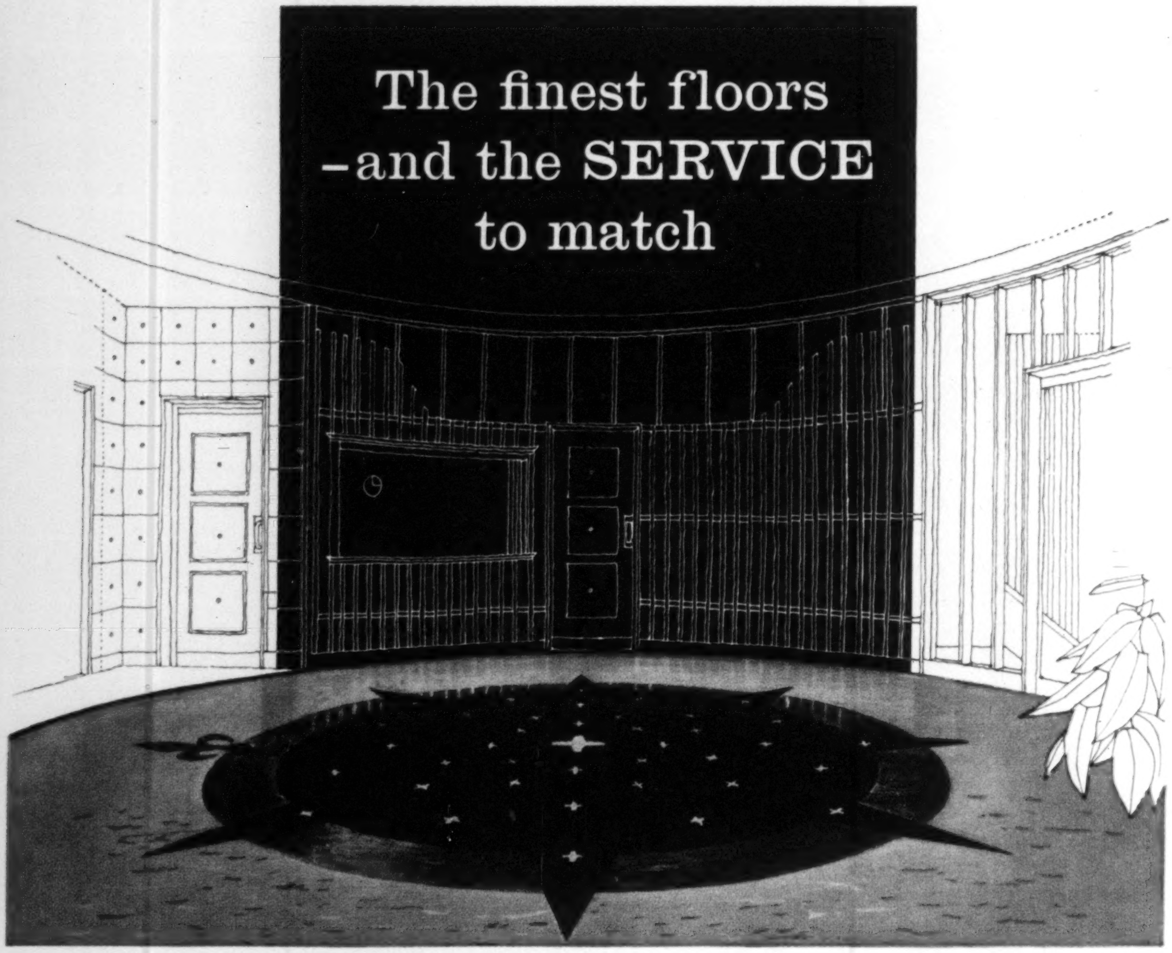

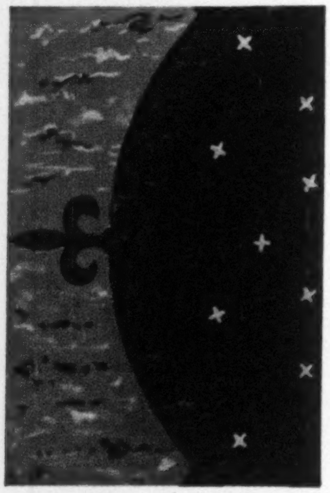

Dunlop Rubber Flooring in the entrance hall at the offices of Messrs. Reardon Smith Ltd., Cardiff.

Semtex, manufacturers of a wide range of flooring materials, including Semastic Decorative Tiles, Semflex Tiles, Vinylex Tiles, Dunlop Rubber Flooring and Vertilex Decorative Wall Tiles, will employ their vast resources in taking welcome responsibility for your entire flooring operation. Twenty contracting branches throughout the country will advise readily on all flooring and pre-treatment problems and offer a highly-skilled laying service, providing, in addition, comprehensive facilities for design.

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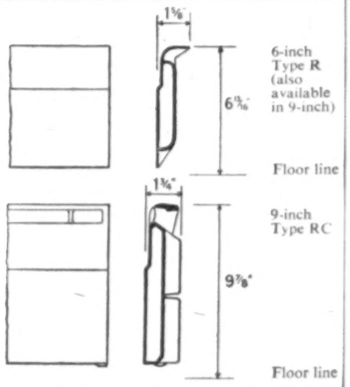
When windows must be wide and deep

The need to introduce—whether for practical or for aesthetic reasons—windows that reach generously from floor to ceiling and wall to wall, might appear to present a problem: the problem of installing an efficient heating system economically without taking up valuable space or marring an otherwise uncluttered design.

There is one system that is designed to answer problems of this kind. It is a system of skirting heating developed by Crane Ltd. Crane Skirting Heating is so unobtrusive and its application so flexible that a great deal of freedom of arrangement is attained.



Manual (No. 423) on Crane Skirting Heating may be had on application to

CRANE LTD., 15-16 RED LION COURT,
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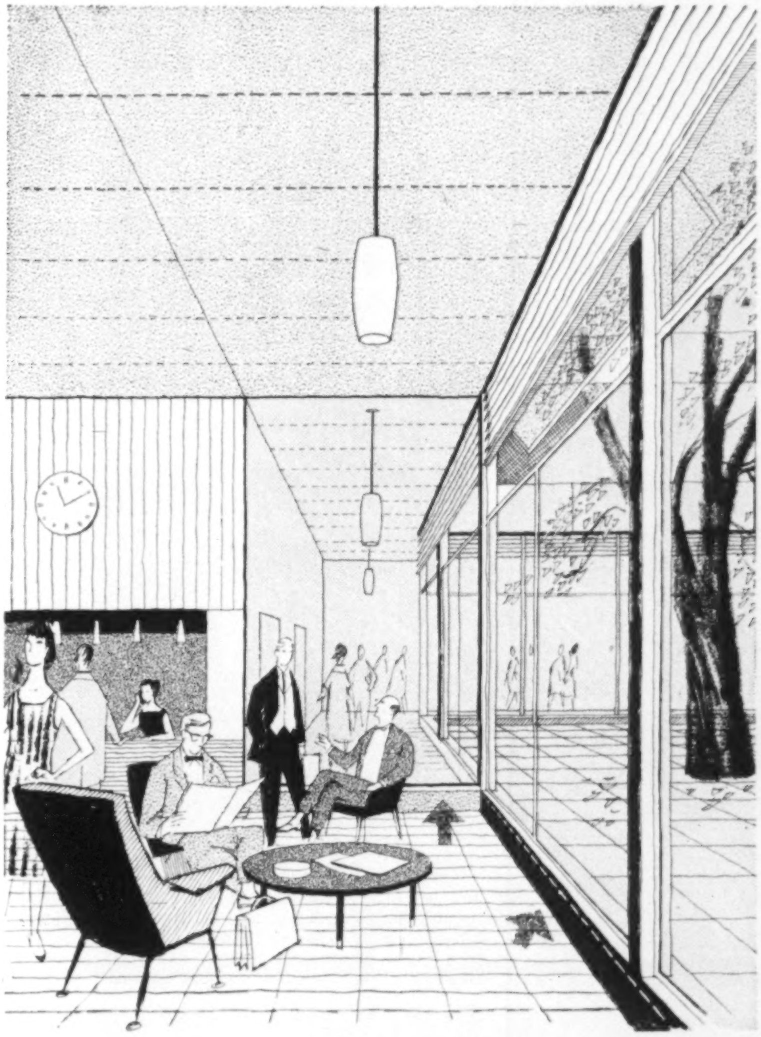

This heating system takes the form of panels which are used in place of the normal skirting. They avoid local 'hot spots' and distribute the warmth evenly where it is needed, without taking valuable floor or wall space. There are two types. Type R, which is purely radiant and made in panels 6-inches and 9-inches high; and Type RC (radiant-convector) in the 9-inch size only (used in the example illustrated and indicated by arrows). All panels are in 2-ft. and 1-ft. lengths and are made of cast iron, which gives them great resistance to accidental damage. The operations of calculating heat requirements and designing the pipework are in principle no different from those for conventional radiator heating systems.

In all cases where the architect needs greater freedom of expression than conventional heating systems allow him, and at the same time has to pay due consideration to costs, the answer is, undoubtedly,

CRANE skirting heating

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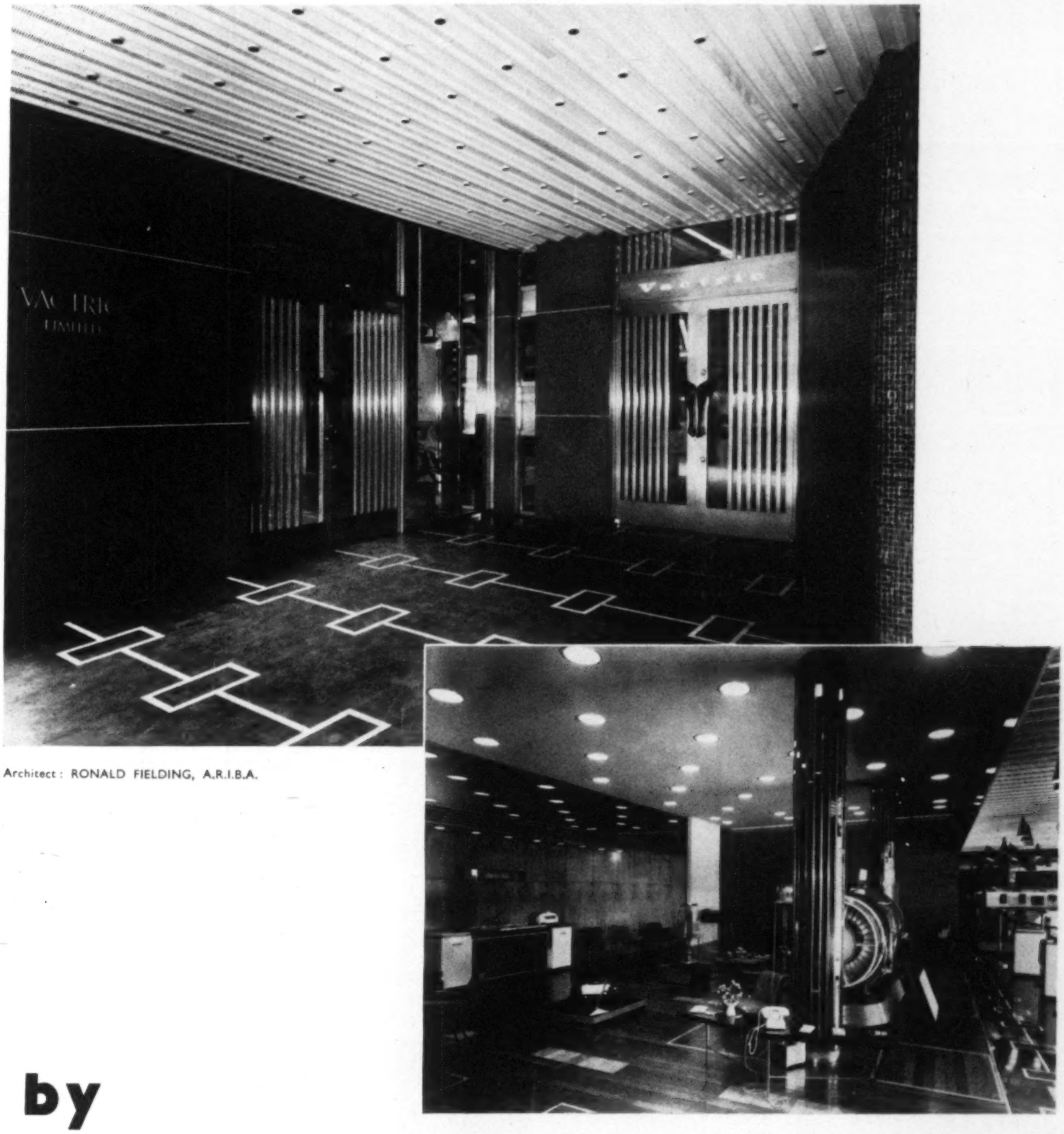

Architect: RONALD FIELDING, A.R.I.B.A.

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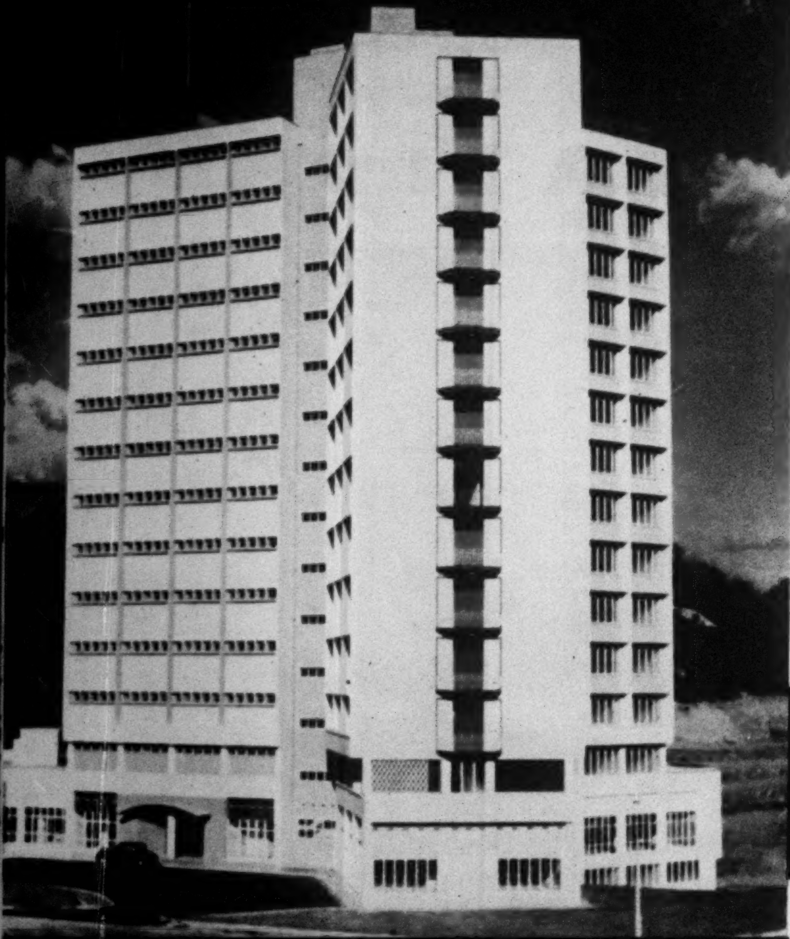

MALAYA

Students' Hostel for the Language Institute and Research Unit at Pantai Valley, Kuala Lumpur, for the Ministry of Education, Federation of Malaya

Architects: Swan and Maclaren

SINGAPORE

Institute of Health

Architects: P W D

NAIROBI

Pioneer General Assurance Building

Architect: Imre Rozsa ARIBA

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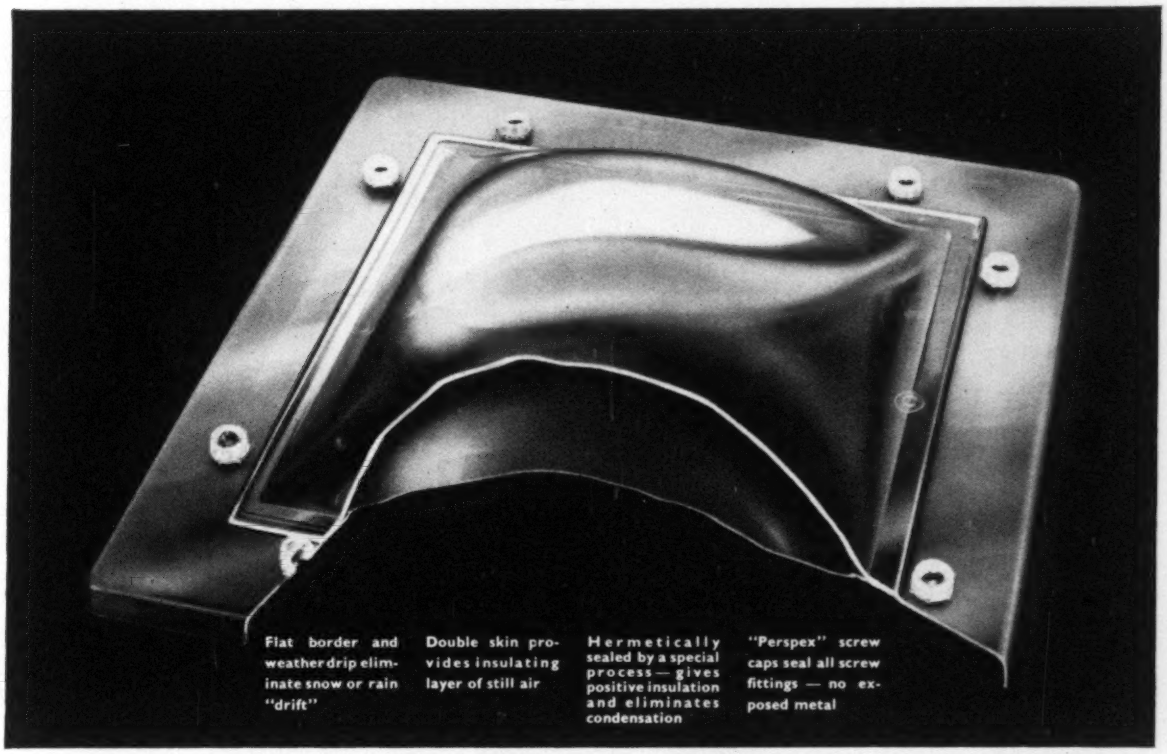

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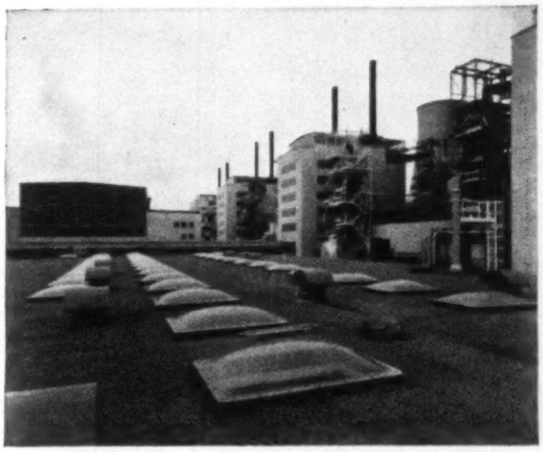

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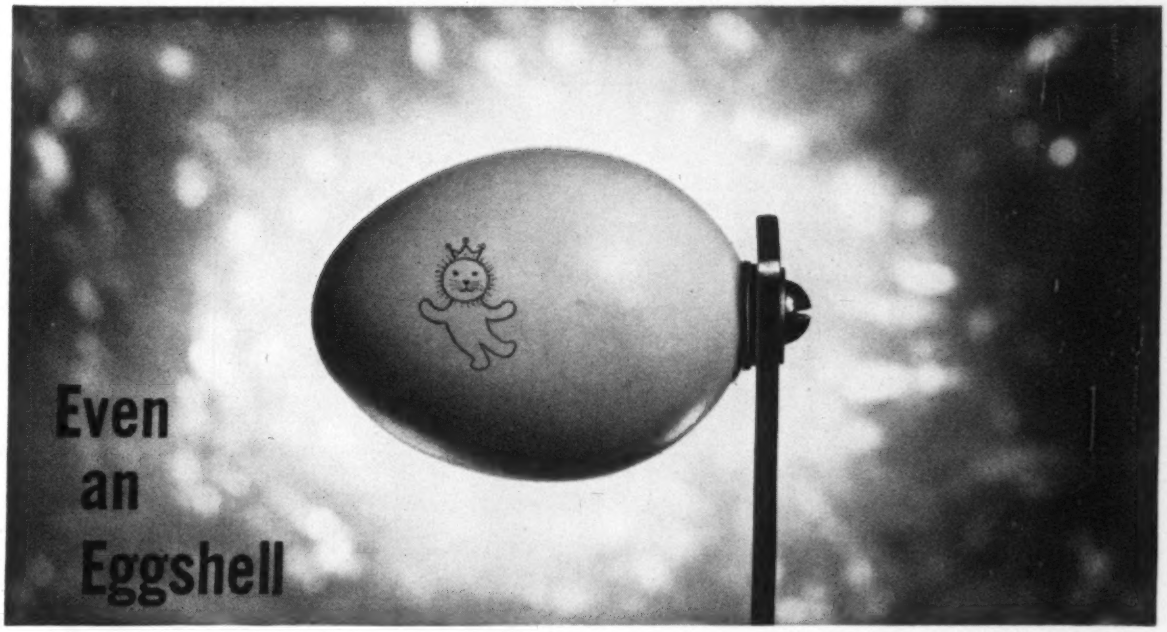

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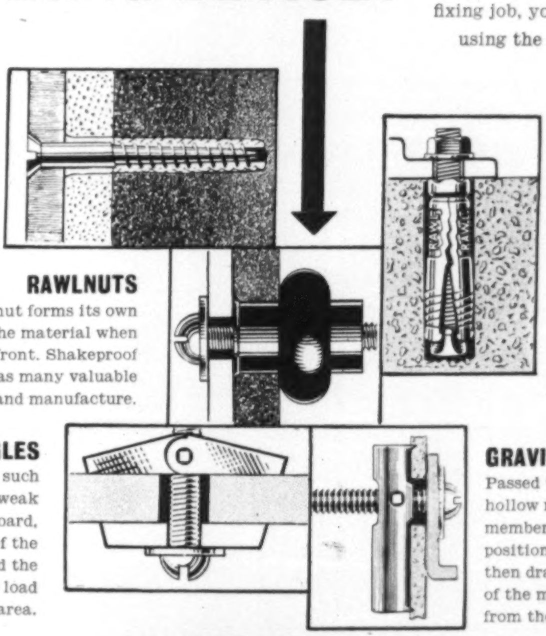

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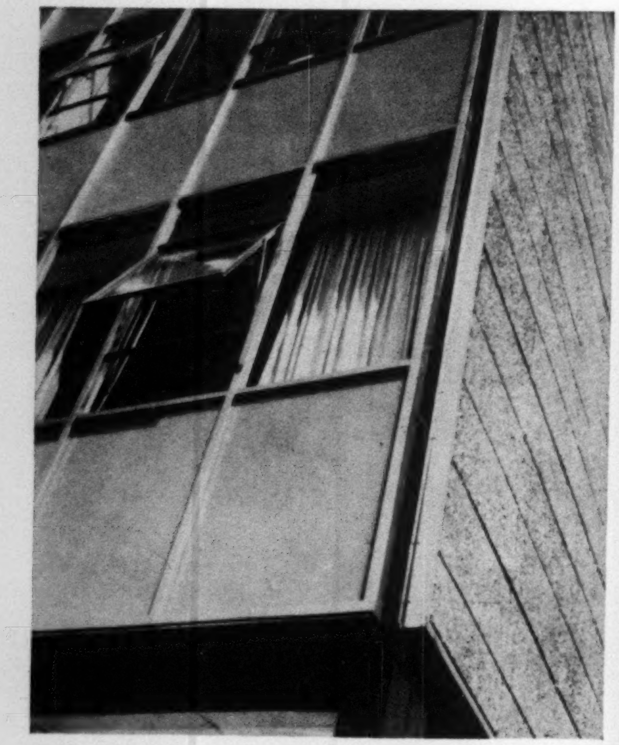

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Architects: Messrs. Farmer and Dark.
Curtain Walling by John Williams (Cardiff) Ltd.

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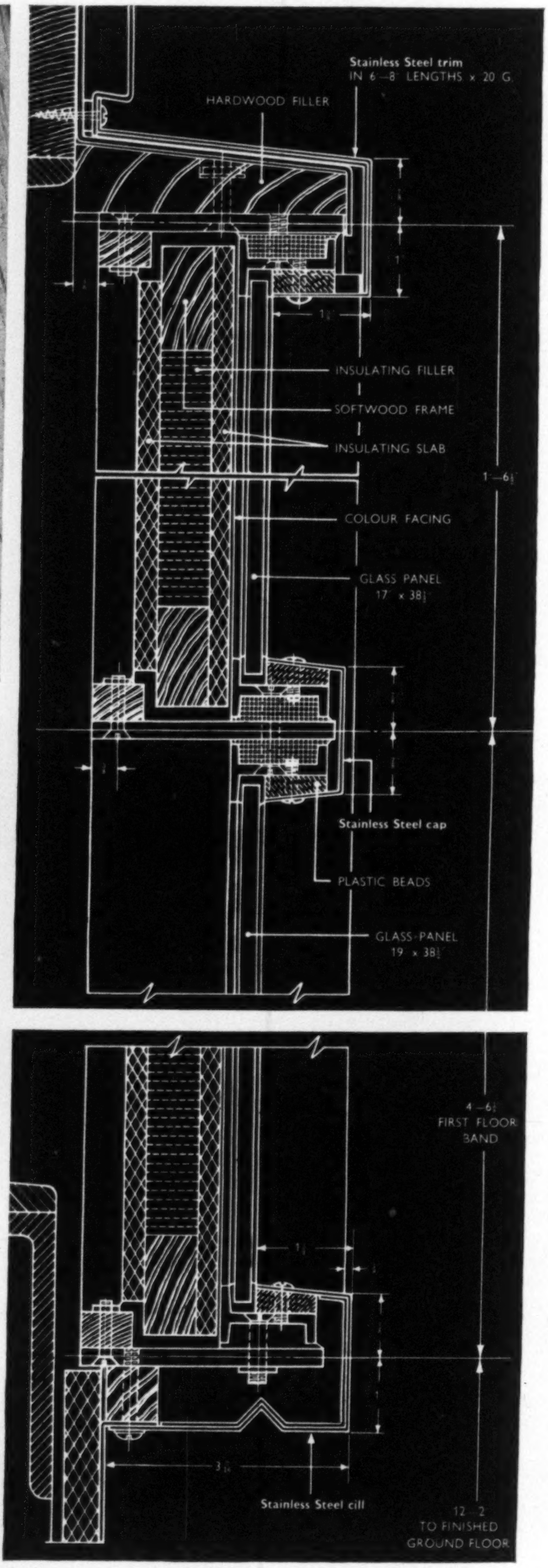
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GLASS PANEL
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Stainless Steel cap
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GLASS-PANEL
19" × 38½"
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FIRST FLOOR
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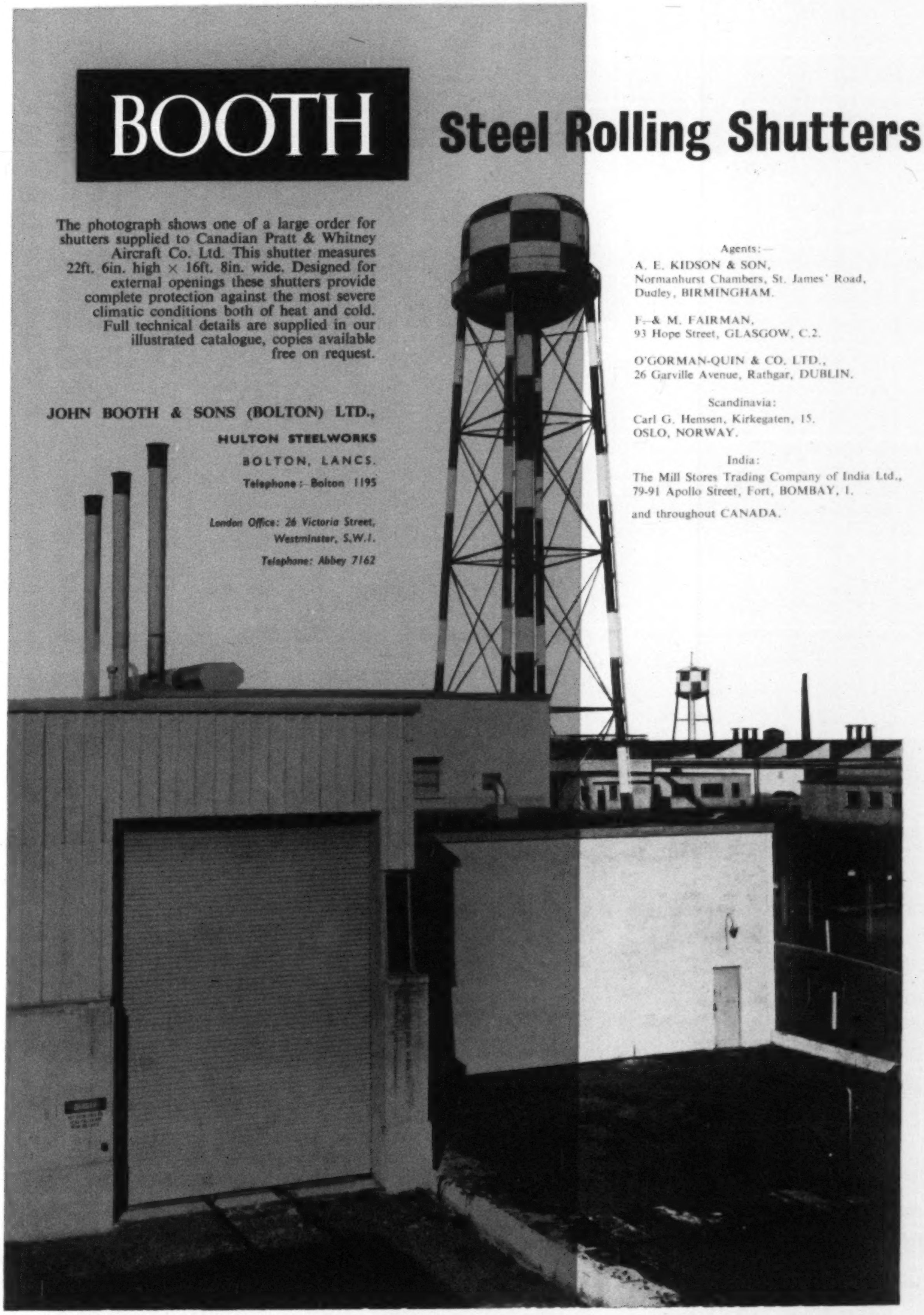

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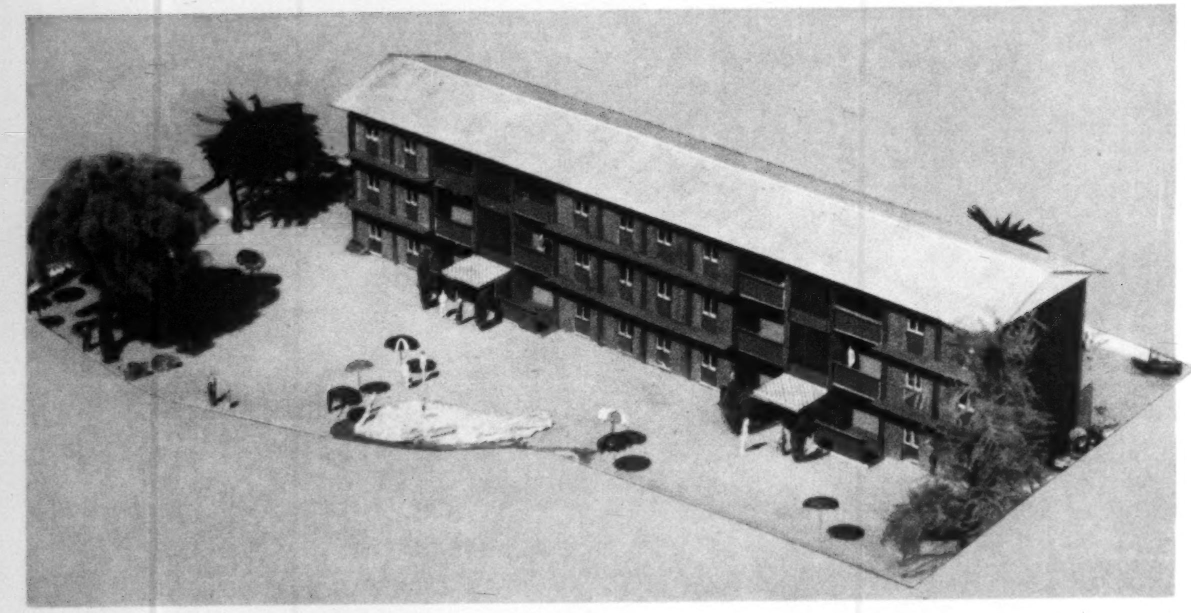

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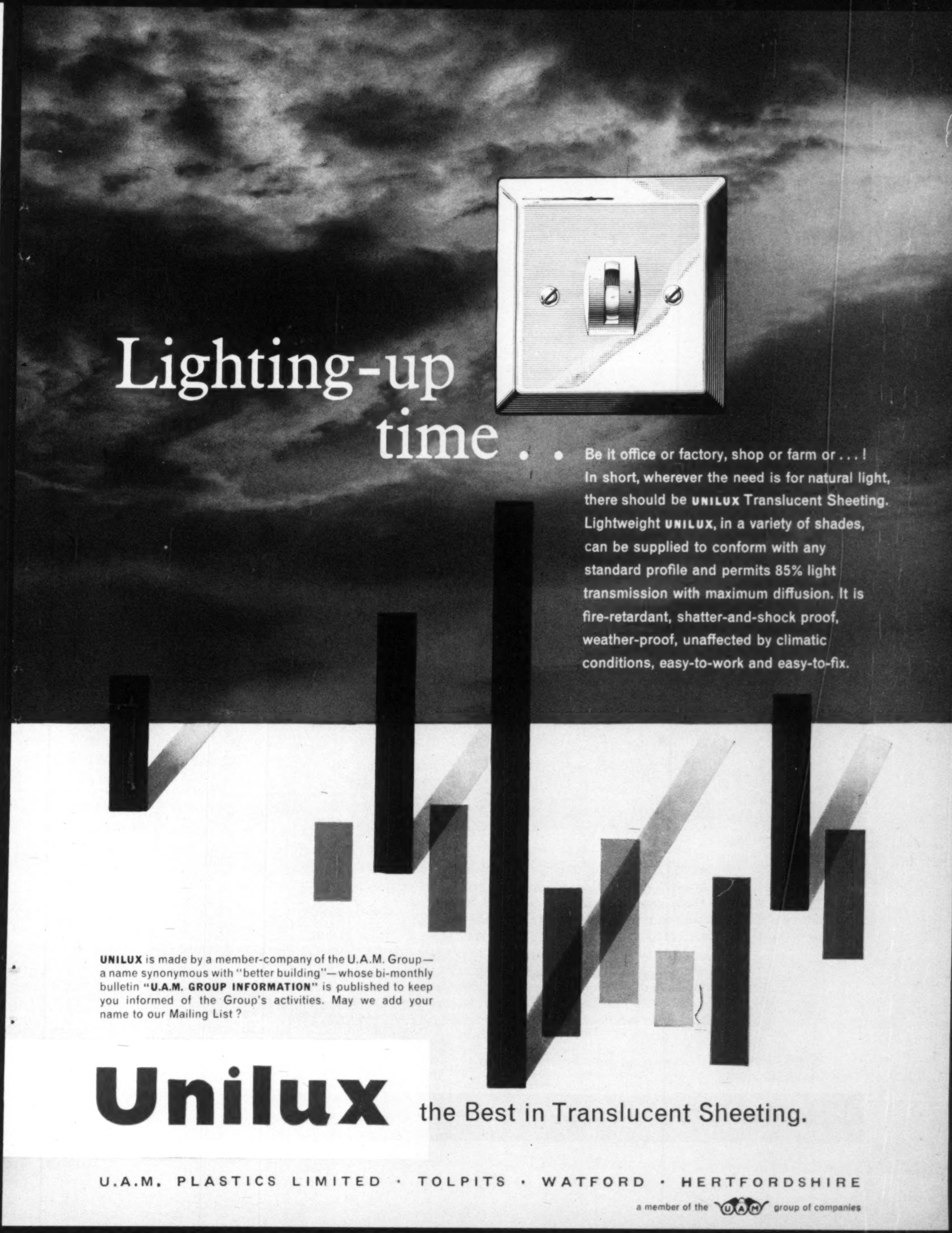

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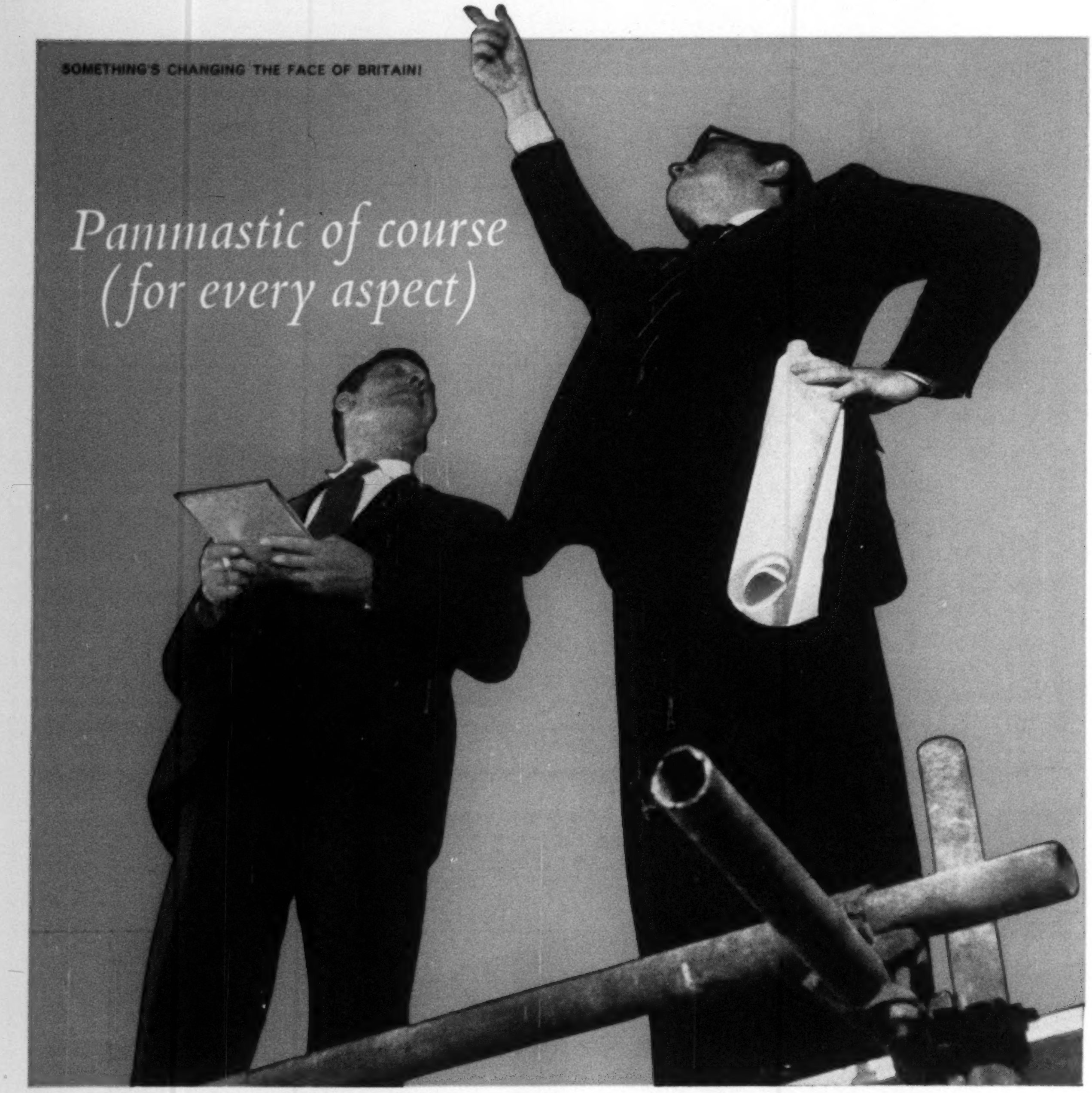
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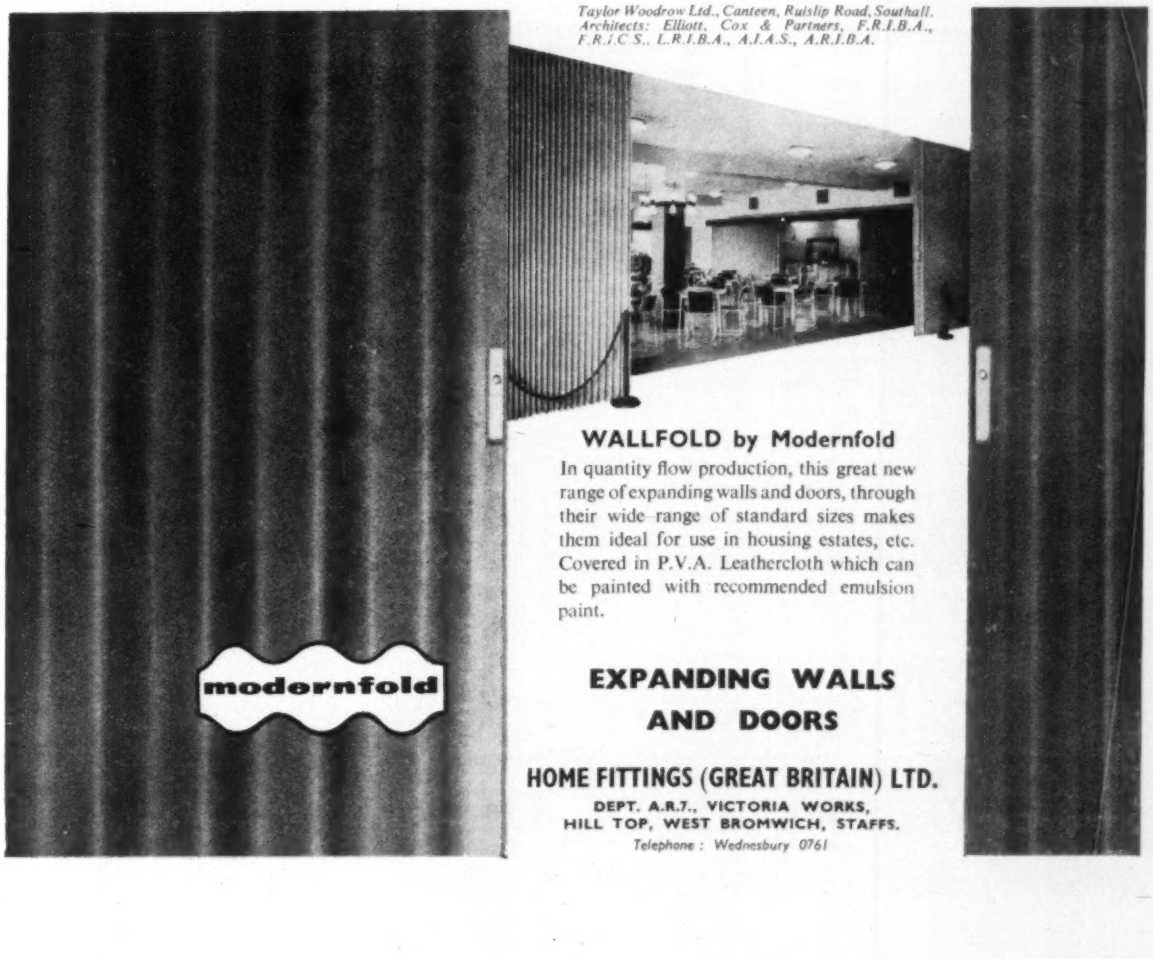

Taylor Woodrow Ltd., Canteen, Ruislip Road, Southall. Architects: Elliott, Cox & Partners, F.R.I.B.A., F.R.I.C.S., L.R.I.B.A., A.I.A.S., A.R.I.B.A.

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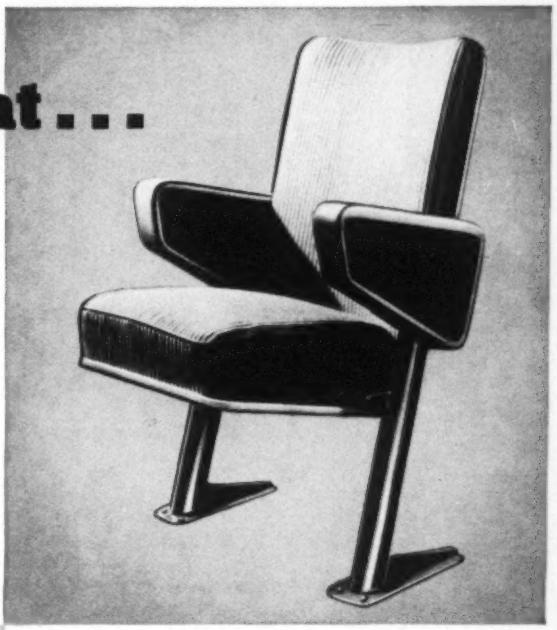
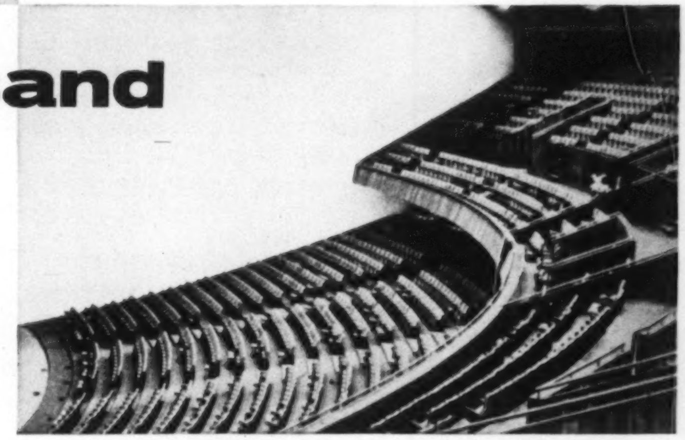


or two

or a thousand



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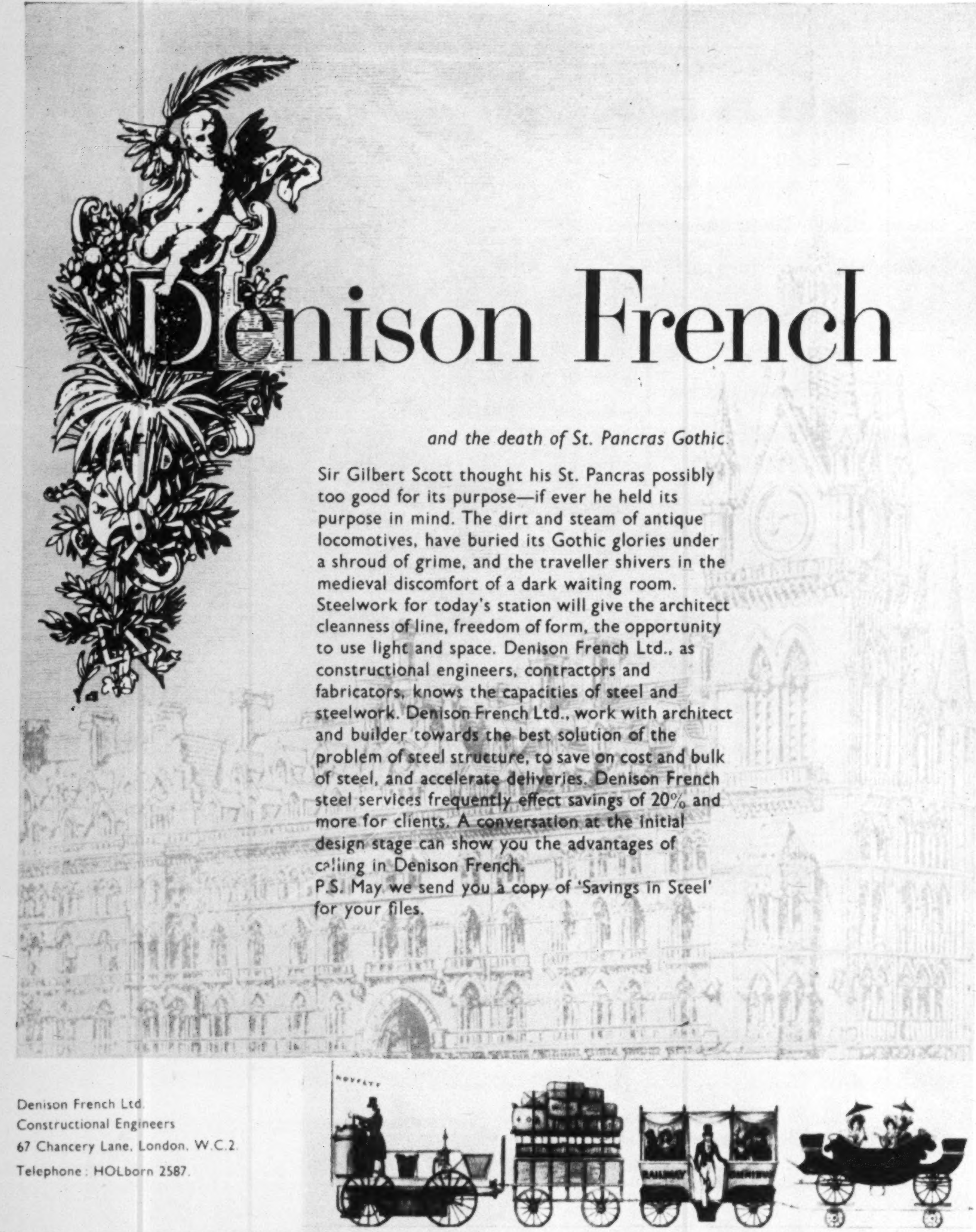

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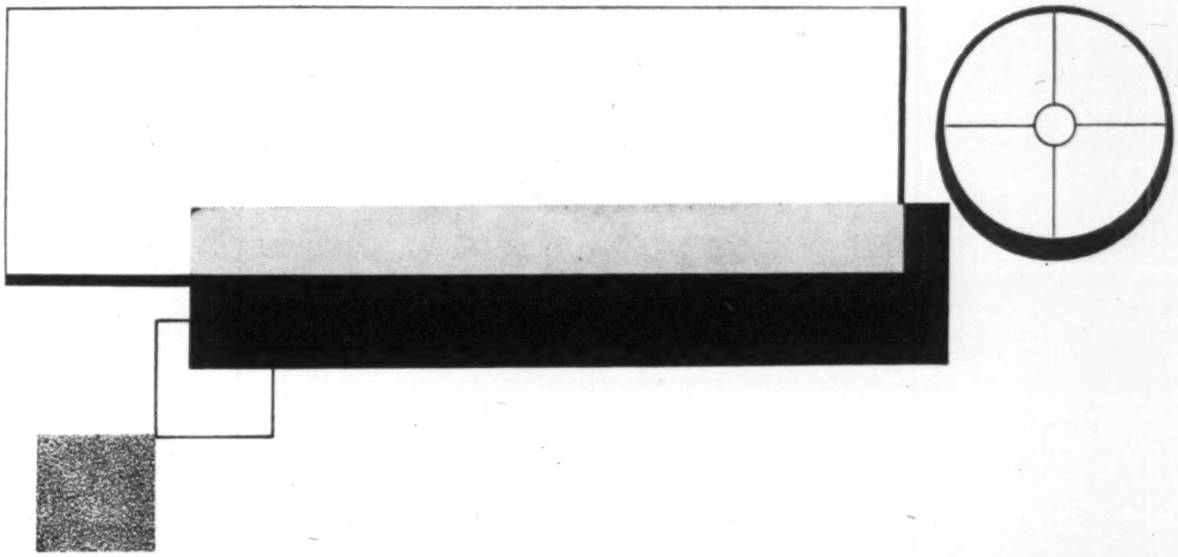
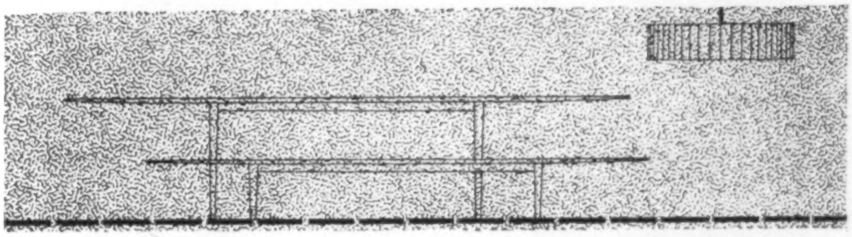


joins in modern architectural design



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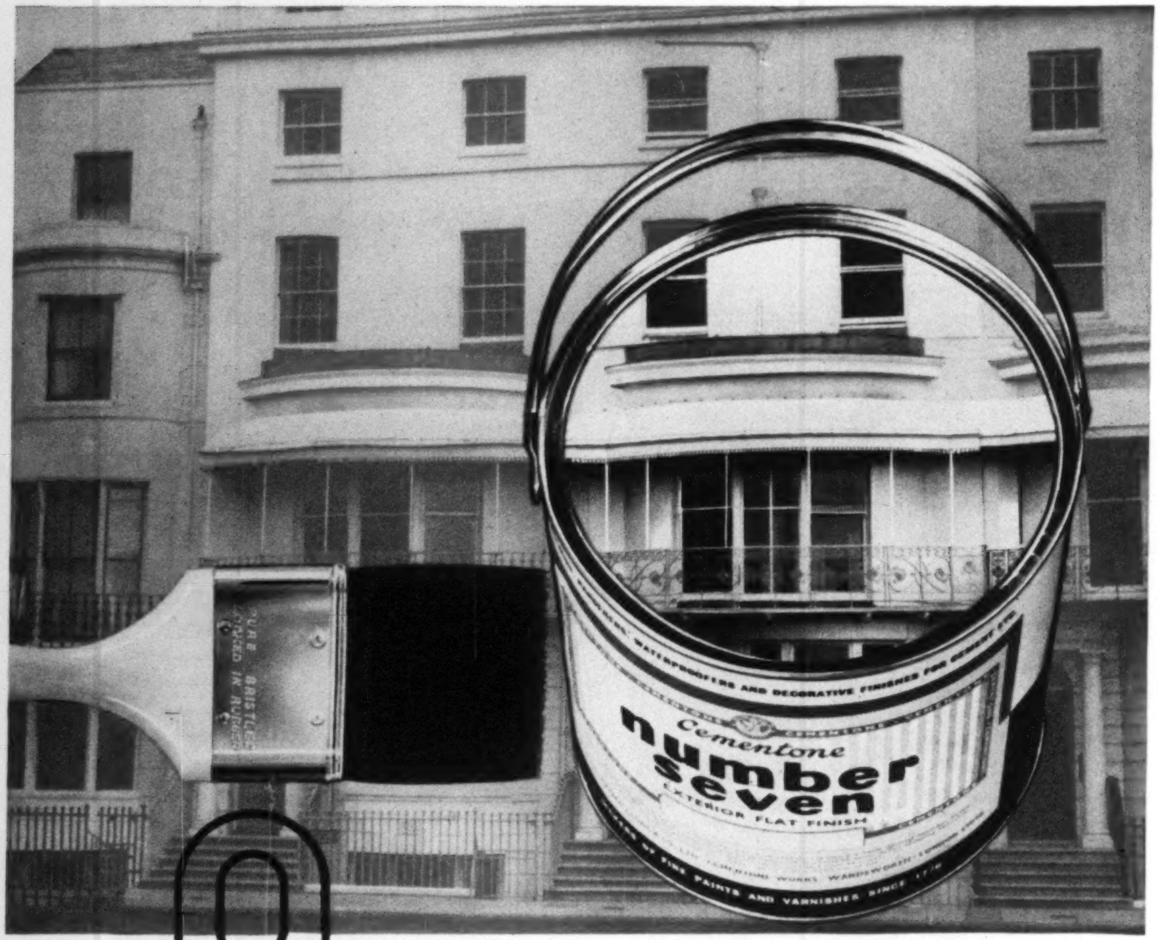
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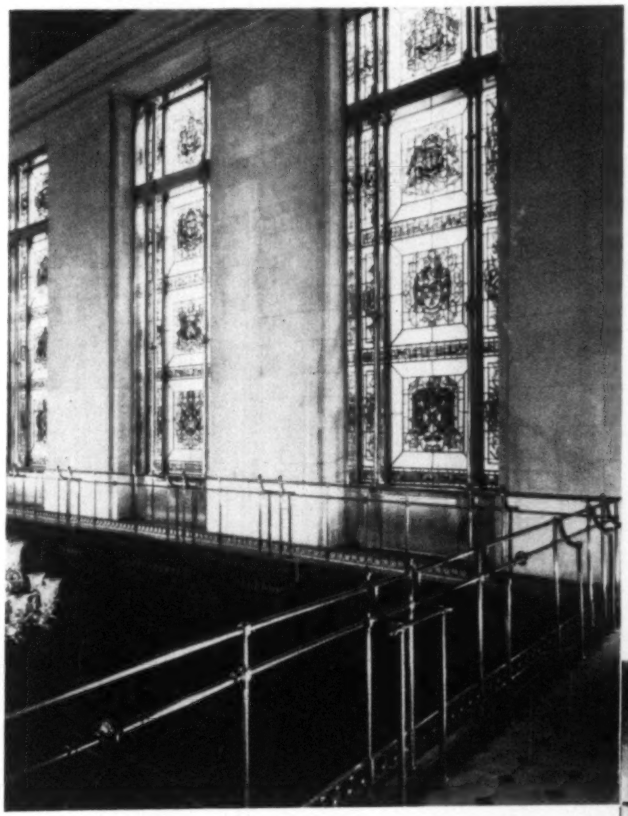

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Architects: C. H. Elsom and Partners.
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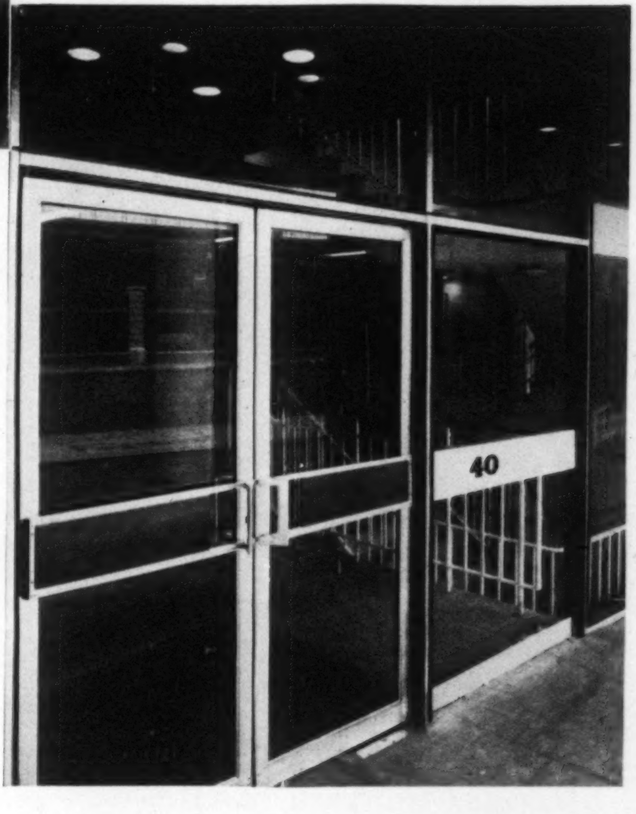

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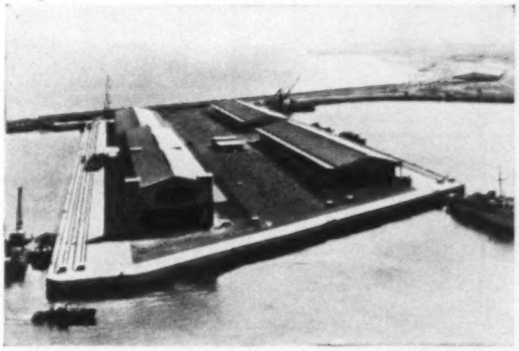

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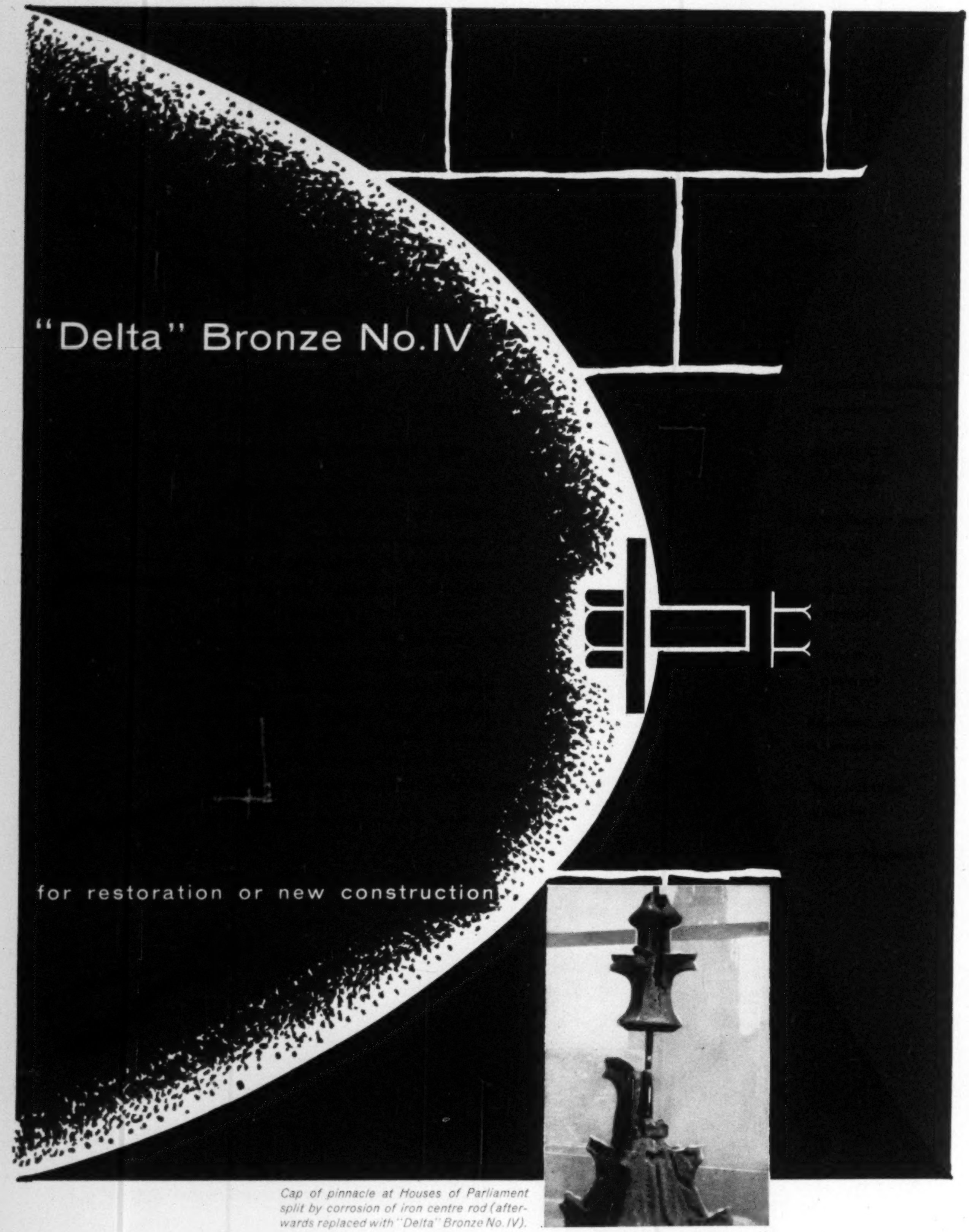
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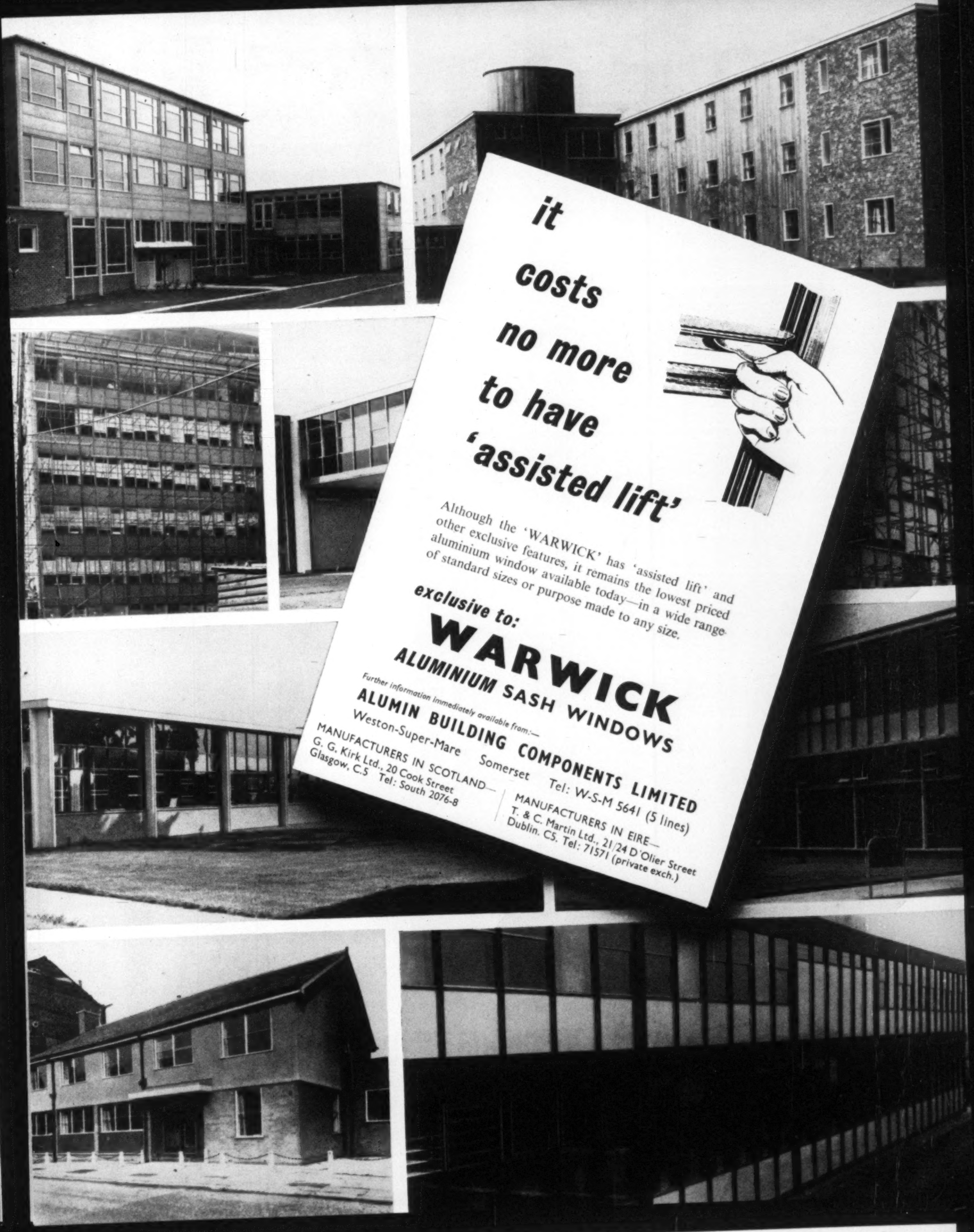

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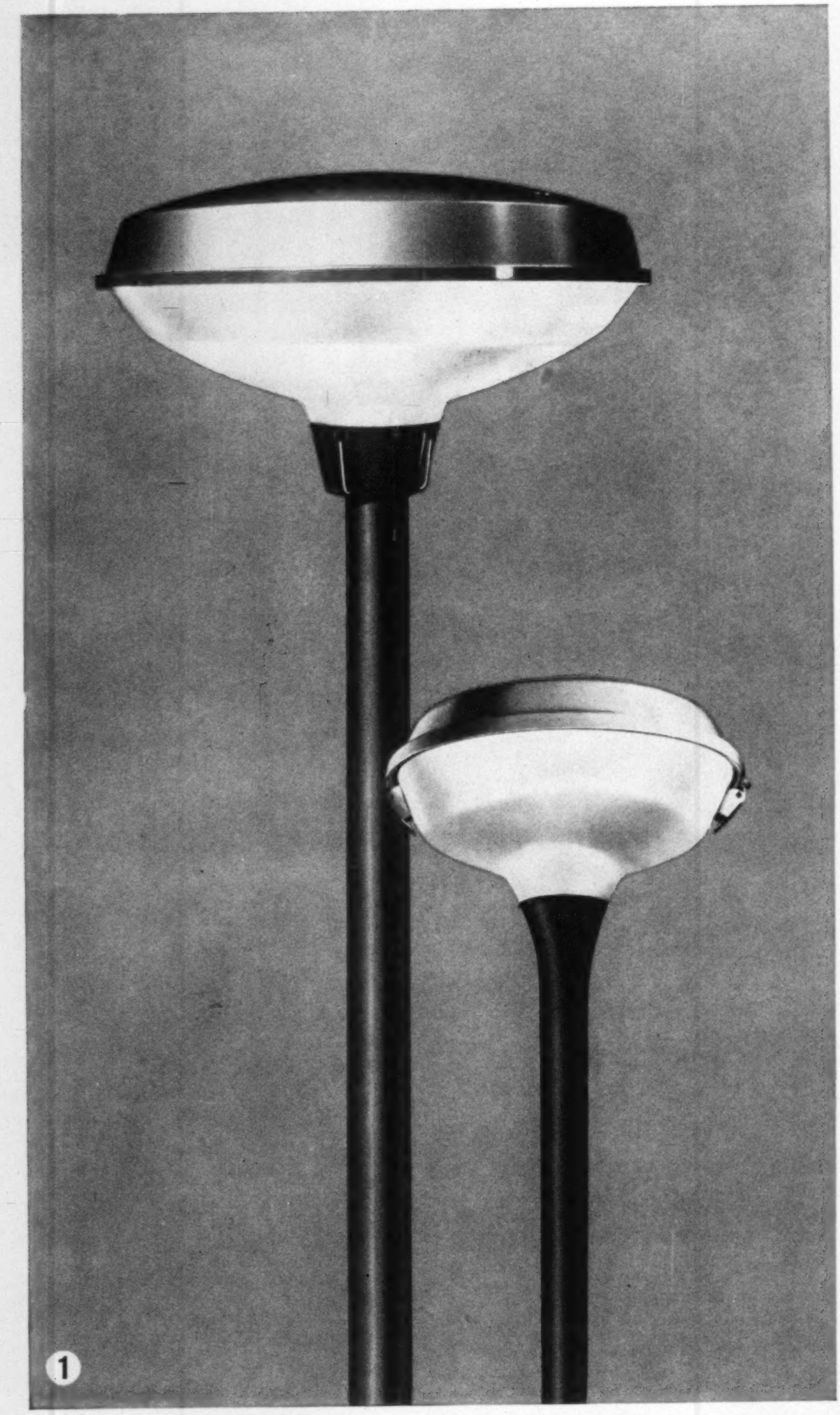
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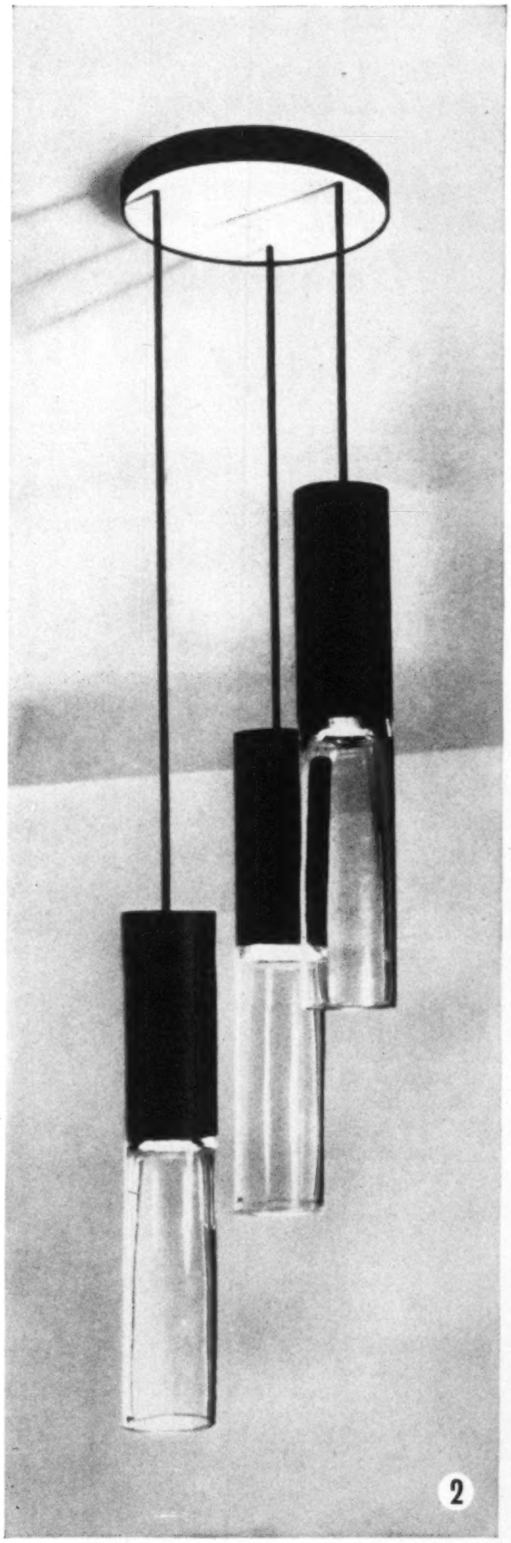

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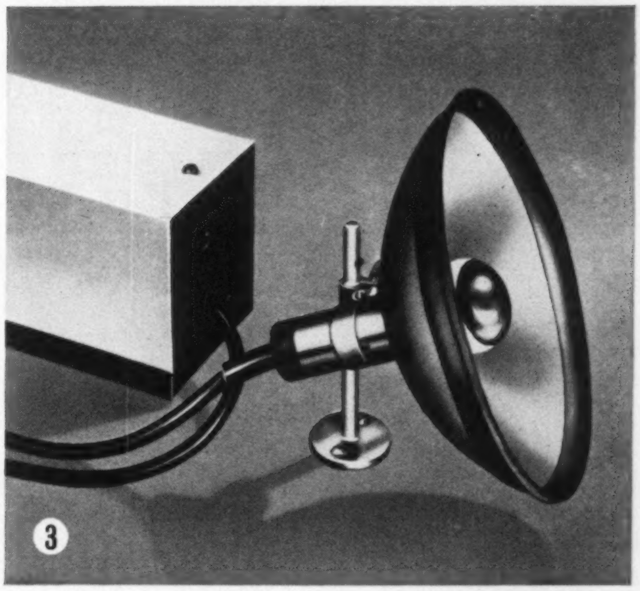

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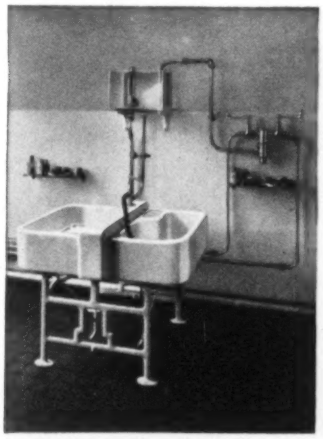

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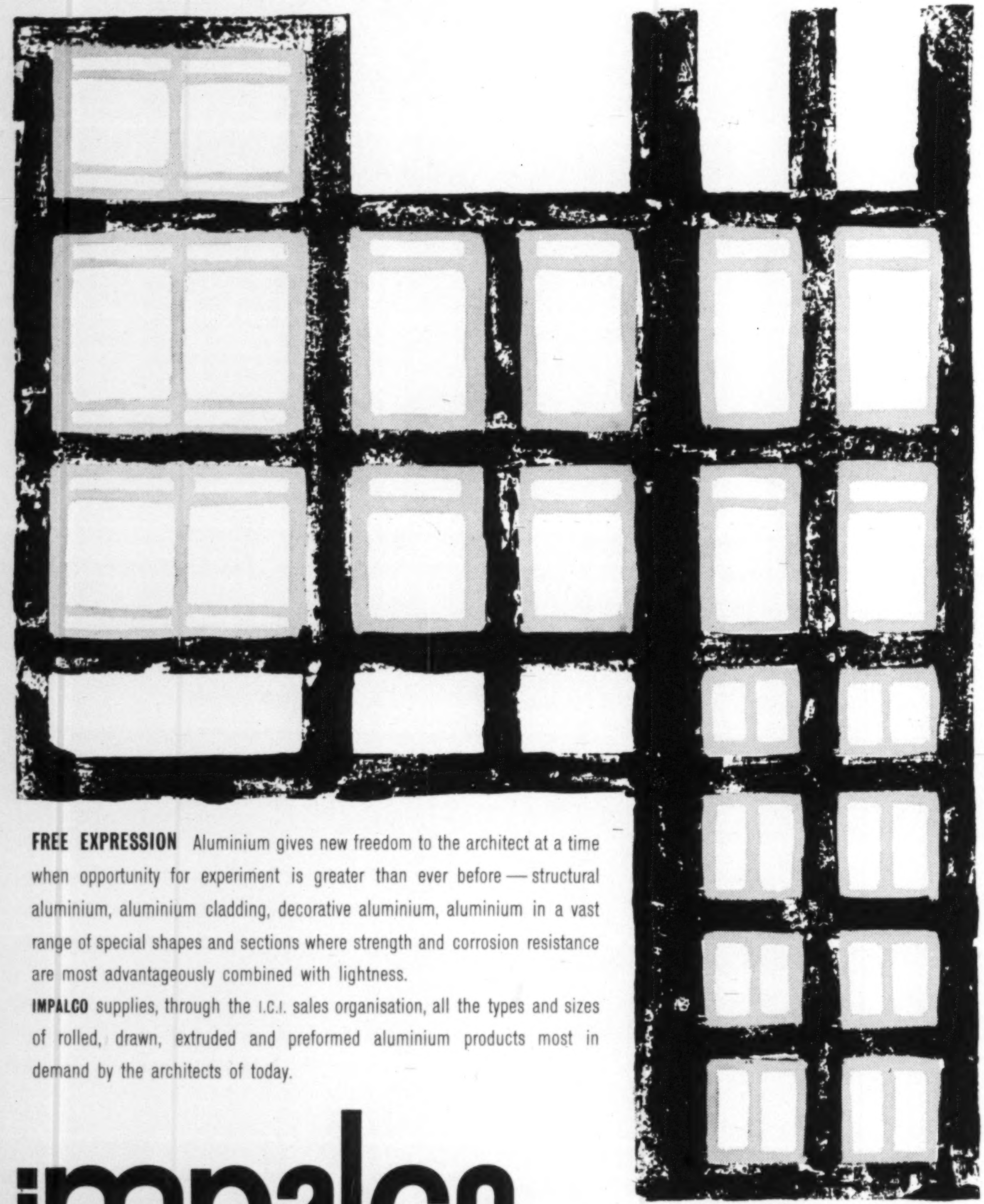

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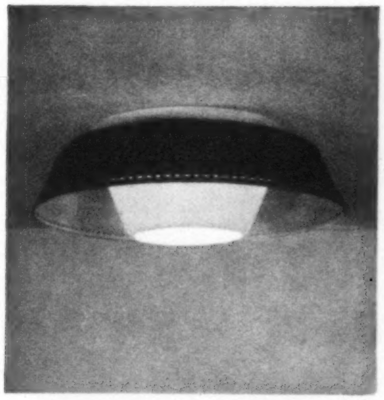

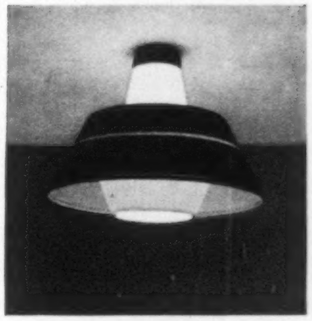

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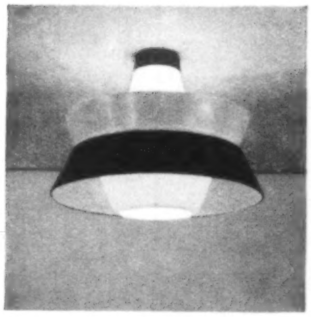

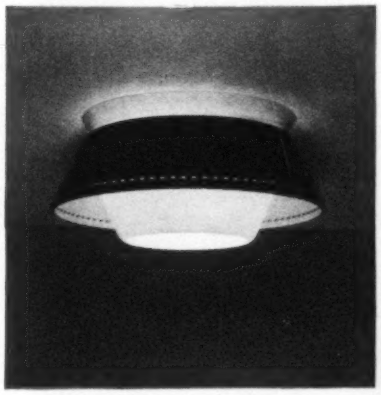

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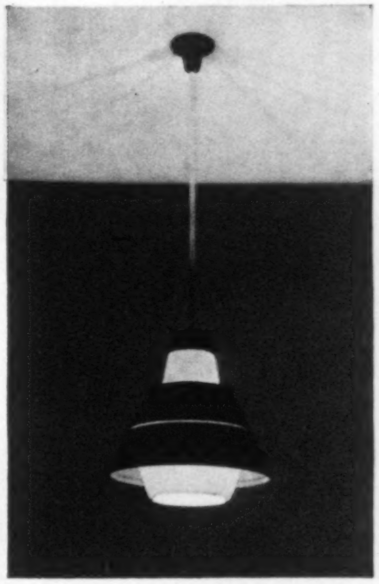

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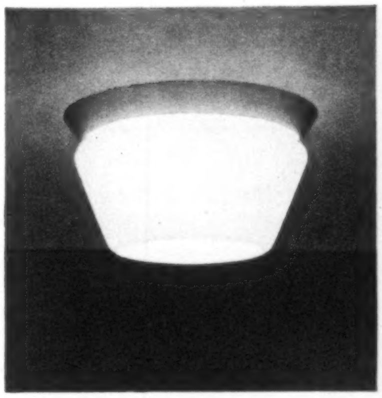

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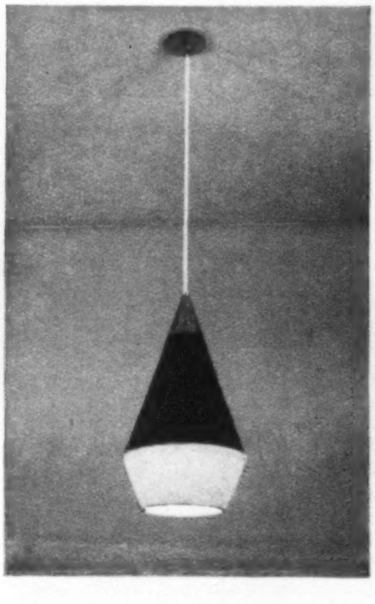

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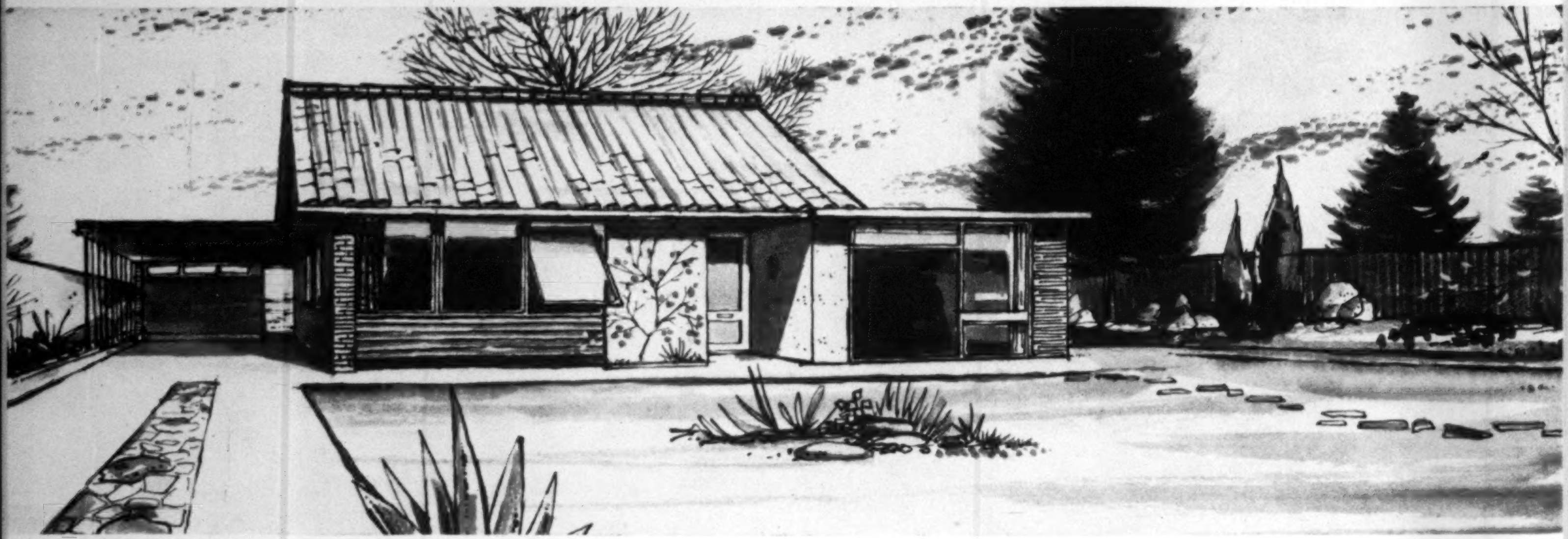
AP 101

HOT NEWS FROM SWEDEN



a new concept in central heating

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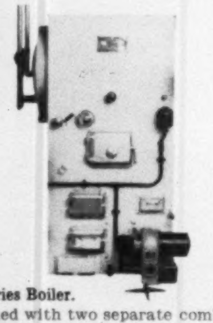

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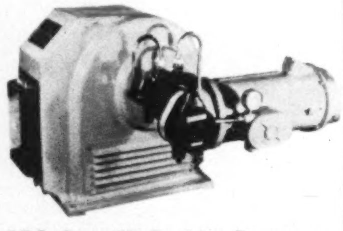

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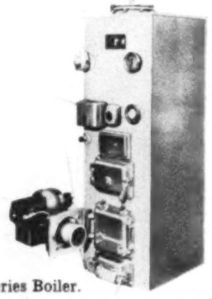

160 Series Boiler.

Type 162 is designed to operate efficiently on either oil or solid fuel. Has single combustion chamber, but with hinged burner. This permits waste disposal and solid fuel burning without alteration to the boiler. Rating 70,000 BTU/HR TOTAL. Cylinder capacity 23 galls.

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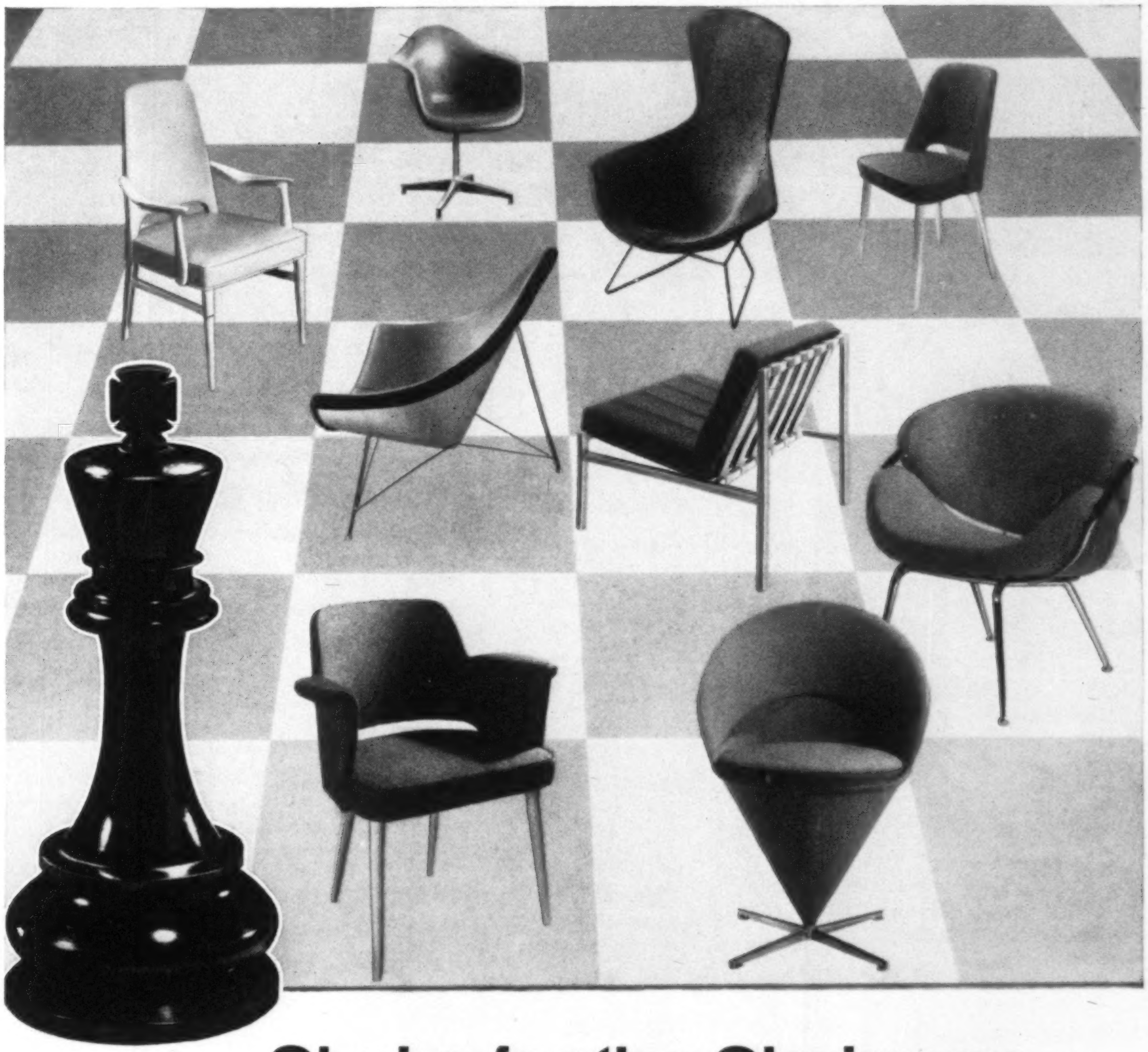

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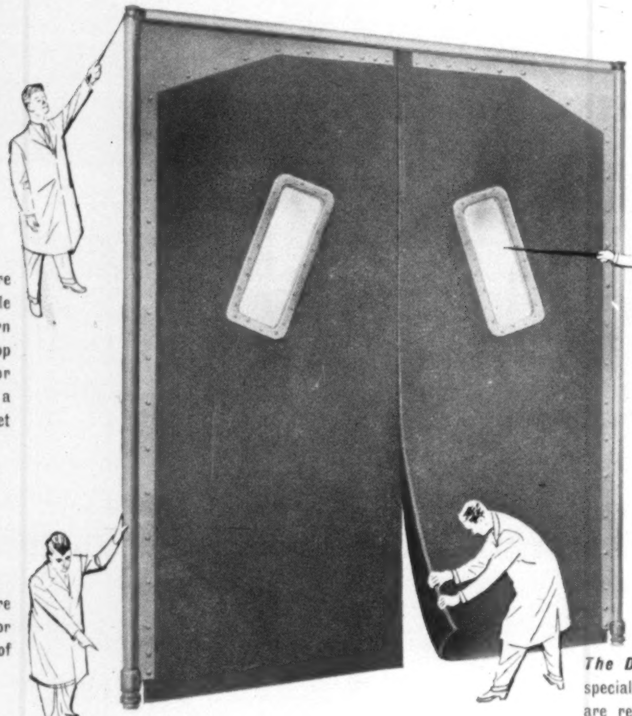
NEWAY

Flexible Doors

by the people who pioneered them



Light Rubber Doors are fitted with a fully adjustable patented double action return spring, concealed in the top of the tubular steel door frame. The door pivots on a hardened cone bearing let into the floor.

Vision Panels on the light doors are supplied with $\frac{1}{4}''$ Perspex and $\frac{1}{2}''$ Perspex on the heavy doors.

Heavy Rubber Doors are fitted with adjustable door springs top and bottom of each leaf.

The Dunlop Panels are specially manufactured and are reinforced with cotton duck. In the light door 42 oz. 2-ply and 42 oz. 4-ply in the heavy door.

All doors can be fitted with additional vision panels if required. Jamb brackets can be supplied for both light and heavy doors where the floor cannot be cut or if there is no head. Neway doors are truly flexible they can be tailored to fit most openings.

DUNLOP *make the Rubber Panels.*

NEWAY **FLEXIBLE RUBBER DOORS**

See Neway Flexible Doors at the Building Centre, 26 Store Street, London, W.C.1. or write for free leaflet to the Manufacturers. Architects are invited to apply for Specification Sheets.

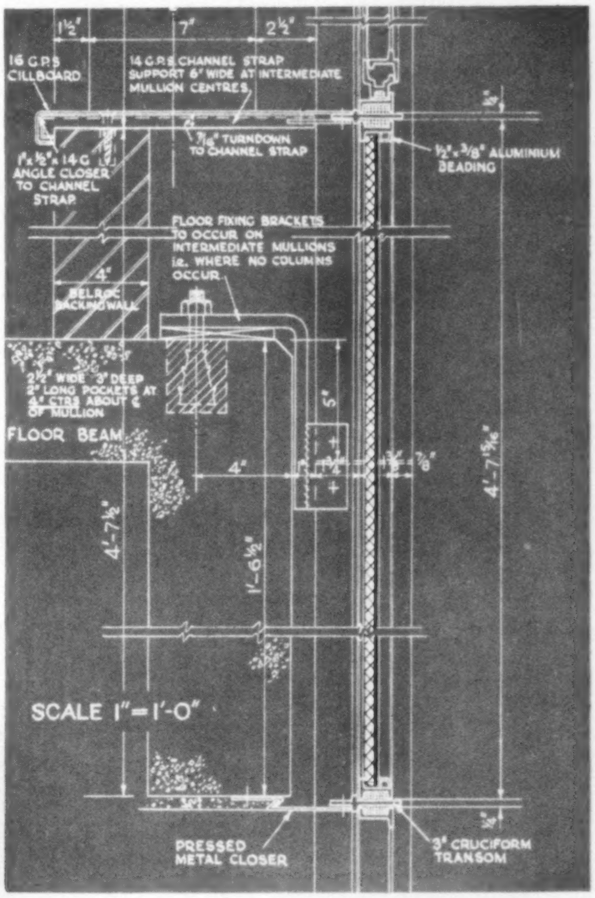
WILLIAM NEWMAN & SONS LTD. (Dept. AR4), HOSPITAL STREET, BIRMINGHAM 19

Curran SEAPORCLAD INFILL PANEL TYPE No 7

Seaporclad vitreous enamel steel* Infill Panel Type No 7 which has been used to clad the new Cyntwell School, Cardiff is one of a wide range of infill and facing panels manufactured by Curran Engineering Ltd. These panels provide permanent colour and excellent insulation. They are light and versatile in use and quickly assembled. The smooth vitreous enamelled surfaces are washed by every rainfall and require the minimum maintenance. Panels are available up to 8′0″ × 4′0″. Recommended maximum size is 6′0″ × 4′0″. Seaporclad panels comply with the standards and specifications laid down by the Vitreous Enamel Development Council. Full technical information is available from the sole manufacturers in the British Isles: Edward Curran Engineering Ltd. Architectural Division, Cardiff. Telephone: Cardiff 33644.

** Curran vitreous enamel is a true glass surface fired at 860°C on steel; it is permanent, will not fade and is highly resistant to chemical attack.*

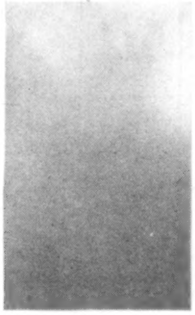
Seaporclad Infill Panels are also being manufactured and used in Australia, Austria, Belgium, Brazil, Canada, Chile, Denmark, France, Germany, Holland, Italy, Japan, Luxembourg, New Zealand, Norway, South Africa, Spain, Sweden, Switzerland, Turkey, United States of America.


1½″
7″
2½″
16 G.P.S CILLBOARD
14 G.P.S. CHANNEL STRAP SUPPORT 6″ WIDE AT INTERMEDIATE MULLION CENTRES
7/16″ TURNDOWN TO CHANNEL STRAP
1″ x ½″ x 14 G ANGLE CLOSER TO CHANNEL STRAP
½″ x 3/8″ ALUMINIUM BEADING
FLOOR FIXING BRACKETS TO OCCUR ON INTERMEDIATE MULLIONS i.e. WHERE NO COLUMNS OCCUR
4″
BELROC BACKING WALL
2½″ WIDE 3″ DEEP 2″ LONG POCKETS AT 4″ CTRS ABOUT ℄ OF MULLION
FLOOR BEAM
5″
4″
7/8″
4′-7½″
1′-6½″
4′-7 15/16″
SCALE 1″ = 1′-0″
PRESSED METAL CLOSER
3″ CRUCIFORM TRANSOM

CILL AND SECTION

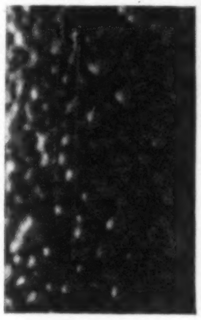
The face is a flat vitreous enamelled 16-gauge steel sheet, bonded with neoprene adhesive to an Asbestolux or asbestos board, $\frac{3}{8}$″, $\frac{1}{2}$″ or $\frac{3}{4}$″ thick. Panel edges are sealed all round with P.V.C. tape.

Core Thickness	$\frac{3}{8}$″	$\frac{1}{2}$″	$\frac{3}{4}$″
Panel Thickness	$\frac{1}{2}$″	$\frac{5}{8}$″	$\frac{7}{8}$″
Weight per sq. ft.	5 lb. 9 oz	6 lb. 0 oz	6 lb. 14 oz
'U' Value	·550	·500	·422



Colour: almost all colours of the British Standard 101 Range.

Finish: available in full gloss, matt and semi-matt.



Texture: supplied stippled, marbled, etc.

THE NEW CYNTWELL SCHOOL, CARDIFF

All panels used are Seaporclad Type 7—a modified version of Type 5. It consists of a flat vitreous enamel steel sheet finished in full gloss and bonded to $\frac{3}{8}$″ Asbestolux, without the back-up sheet of electro-galvanized steel used in Type 5. The panel edges are sealed all round with P.V.C. tape. Total Surface Area: 1228.43 sq. ft.

Architects: City Architects Department, Cardiff.
Contractors: John Laing & Sons Ltd.
Curtain Walling: John Williams of Cardiff Ltd.

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coal begins the

IN 1887 TWELVE MEN in a small workshop in Raleigh Street, Nottingham, were making three bicycles a week. Today, the Raleigh plant and offices have a payroll of over 8,000 and turn out over 1,000,000 cycles and over 2,000,000 Sturmey-Archer hubs every year. Such is the proud record of this famous cycle company.

Obviously the shrewd men who control such a thriving concern have a flair for making long-term decisions that are both wise and profitable.

Raleigh use coal because all their experience has proved that coal gives them all the steam for both power and heat they need at the lowest possible cost. Raleigh are *expanding* on coal because they know that our coalfields contain all the coal that industry can use for many scores of years to come.

cycle at Raleigh

When it is your turn to cast a vote on fuel, remember Raleigh. Coal is the power that starts their wheels spinning so profitably. You can make *sure* that the wheels of your industry do the same for you when you stake your future power on the most reliable of all fuels—coal.

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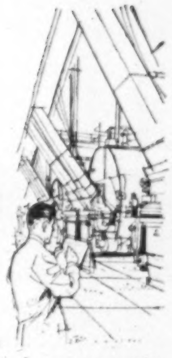
Policy into practice at Raleigh Industries



Mr. L. L. Roberts,
Director of Factories, comments:

"Coal is the fuel chosen for the whole of Raleigh's power-raising plant, including our newest installation which comprises four horizontal economic boilers. These operate on ½″ washed smalls, and have a combined total rating of 74,400 lbs. of steam output per hour from and at 212°F.

An overall average efficiency of 72-75% can be easily maintained, although under test conditions we have recorded efficiencies of 80%.

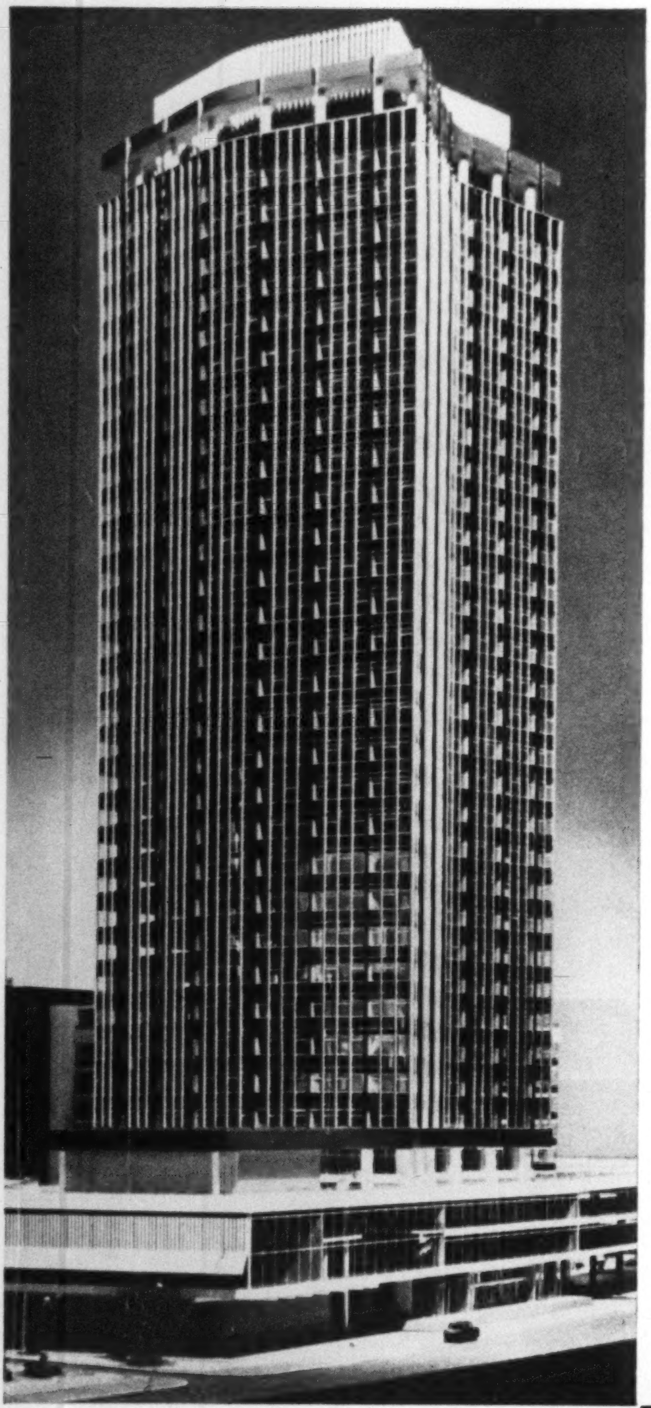
All our coal handling plant is fully mechanised and apart from periodical trimming of the receiving bunkers, the fuel doesn't have to be touched at all by our boilermen anywhere from the delivery bays to the firebeds. After burning, the ash residue is automatically conveyed to overhead storage bunkers outside the boilerhouses, from where it is easily discharged into lorries for disposal.

Our emergency stocks of coal are relatively small. We prefer to operate on a direct supply basis from colliery to boilerhouse for more or less immediate use. This would not suit every firm, but in our special circumstances I am perfectly satisfied that deliveries are reliable enough to make this system dependable, and the possibility of an emergency arising out of failure of supply is very remote. We have operated this way for three years now without any trouble at all and will continue to do so in the future.

Raleigh's decision to use coal is based on economics. We want maximum reliability at the lowest possible cost—and I'm happy to say that with coal that's exactly what we get."

And here are some key facts and figures about the No. 1 Boiler House (Orston Drive)

Boilers:	4 Horizontal Economic boilers
Total capacity:	74,400 lbs. of steam per hour
Method of firing:	Chain grate stokers
Steam pressure:	80 lbs. p.s.i.
Steam temperature:	324°F.
Annual fuel consumption (*all boilerhouses*):	**22,300 tons of coal**



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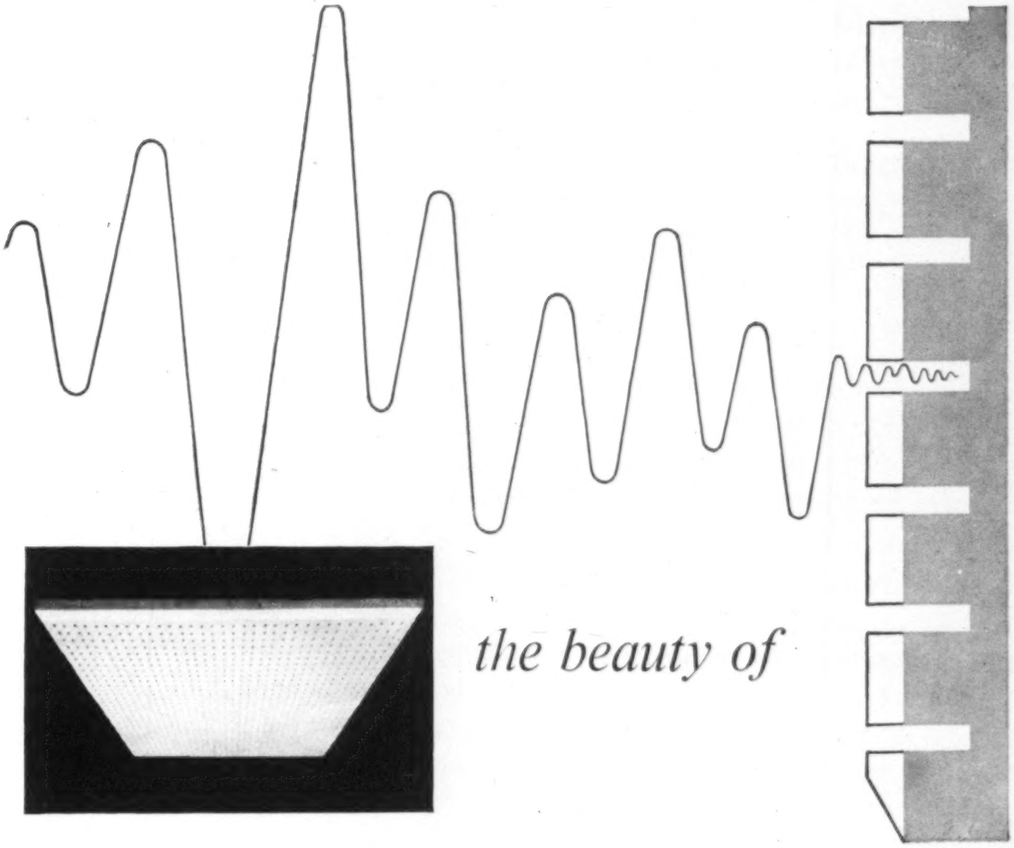

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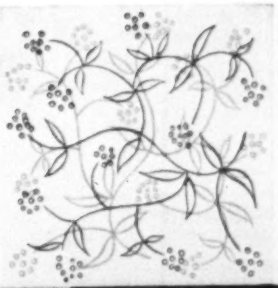

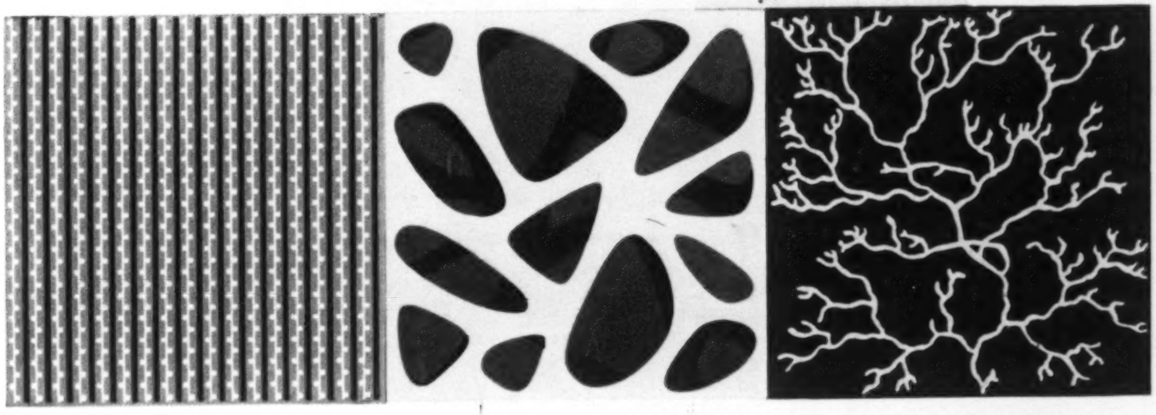

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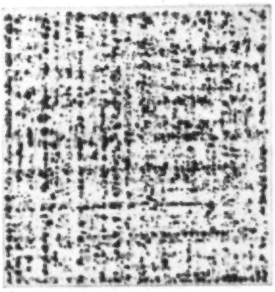

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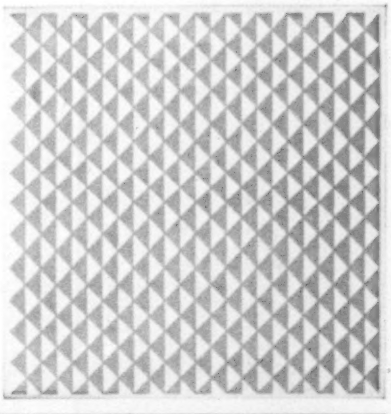

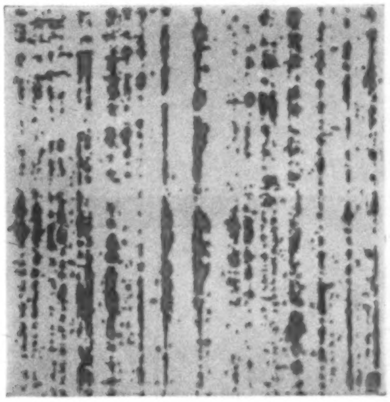

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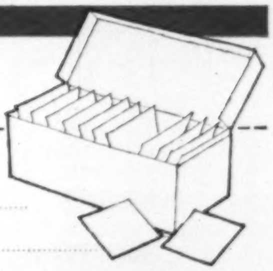

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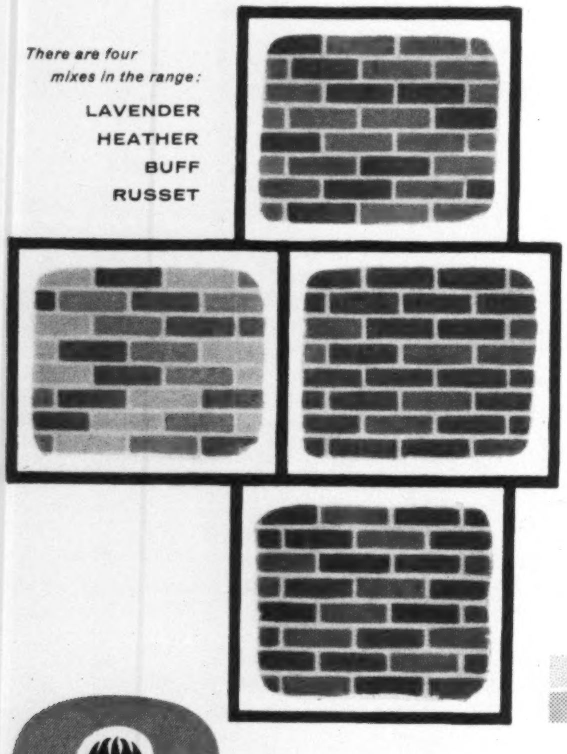

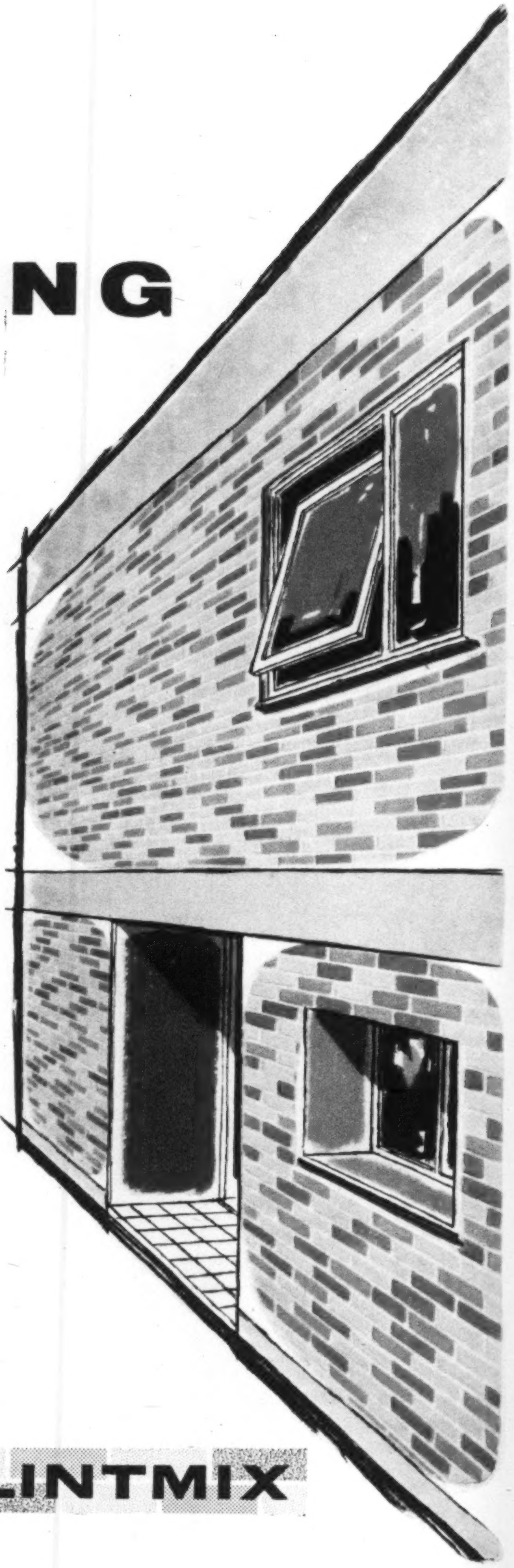

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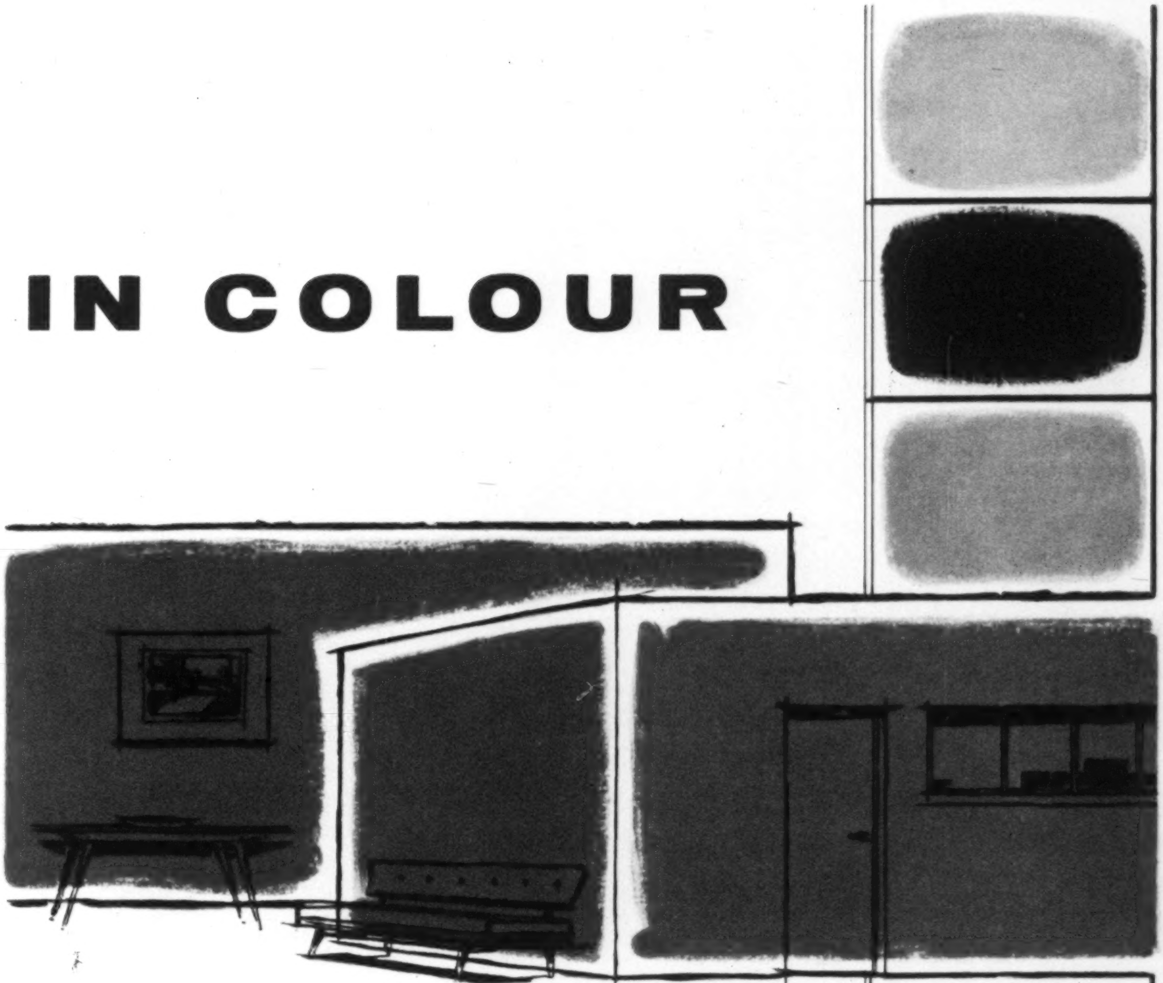

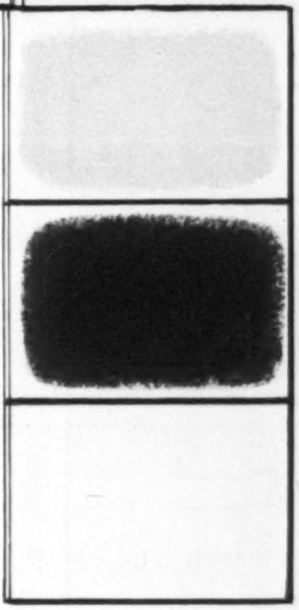

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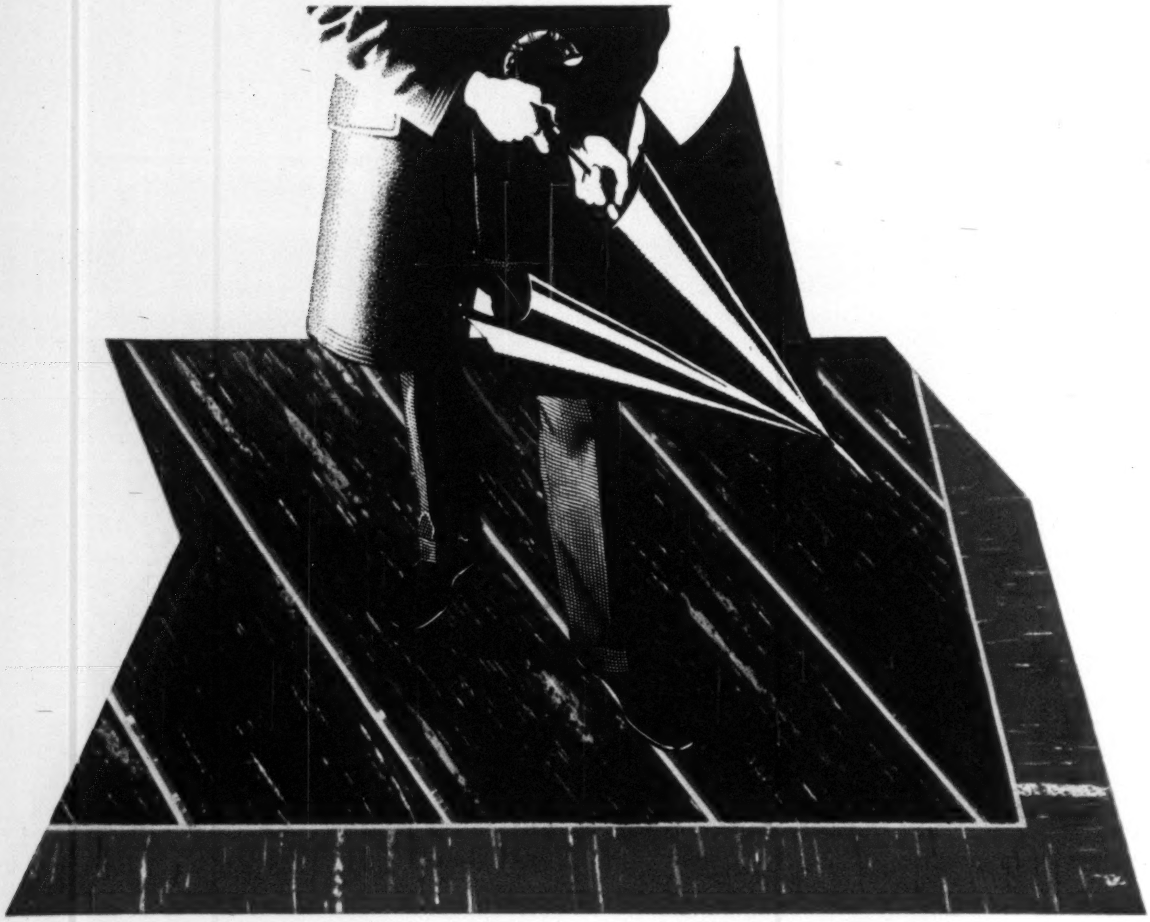

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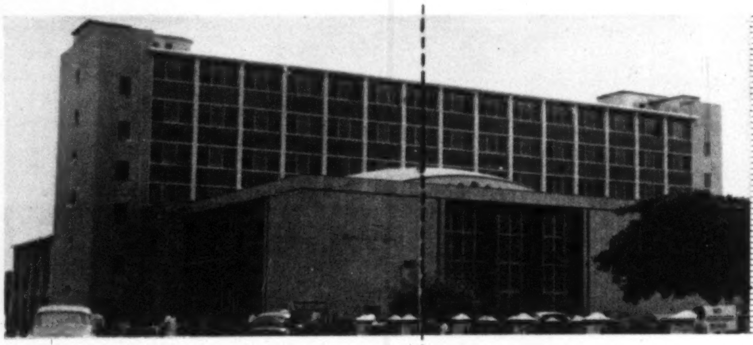

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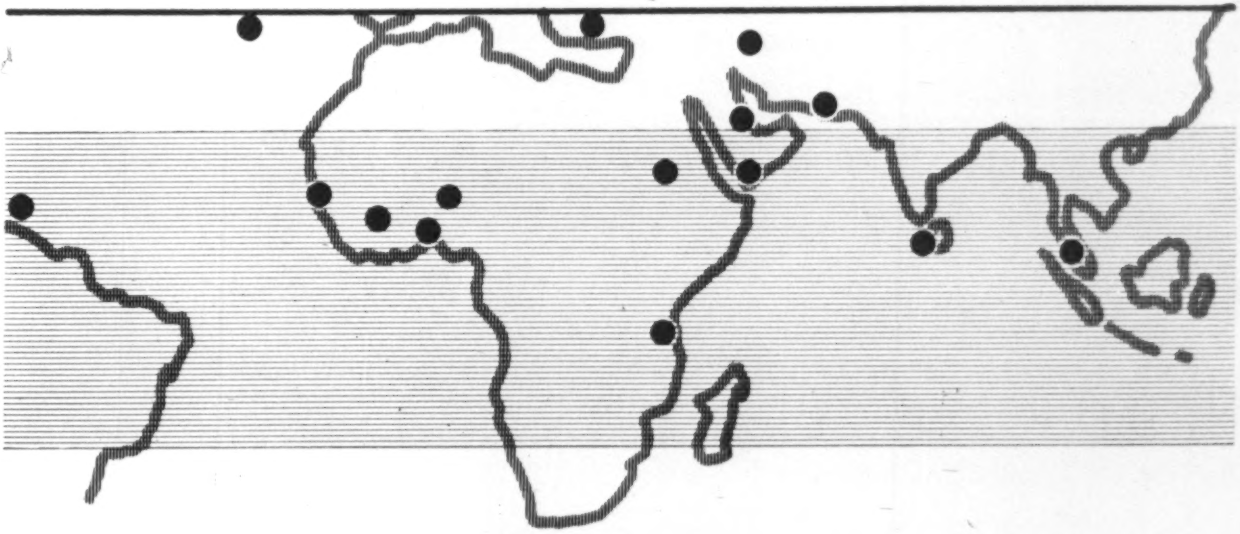

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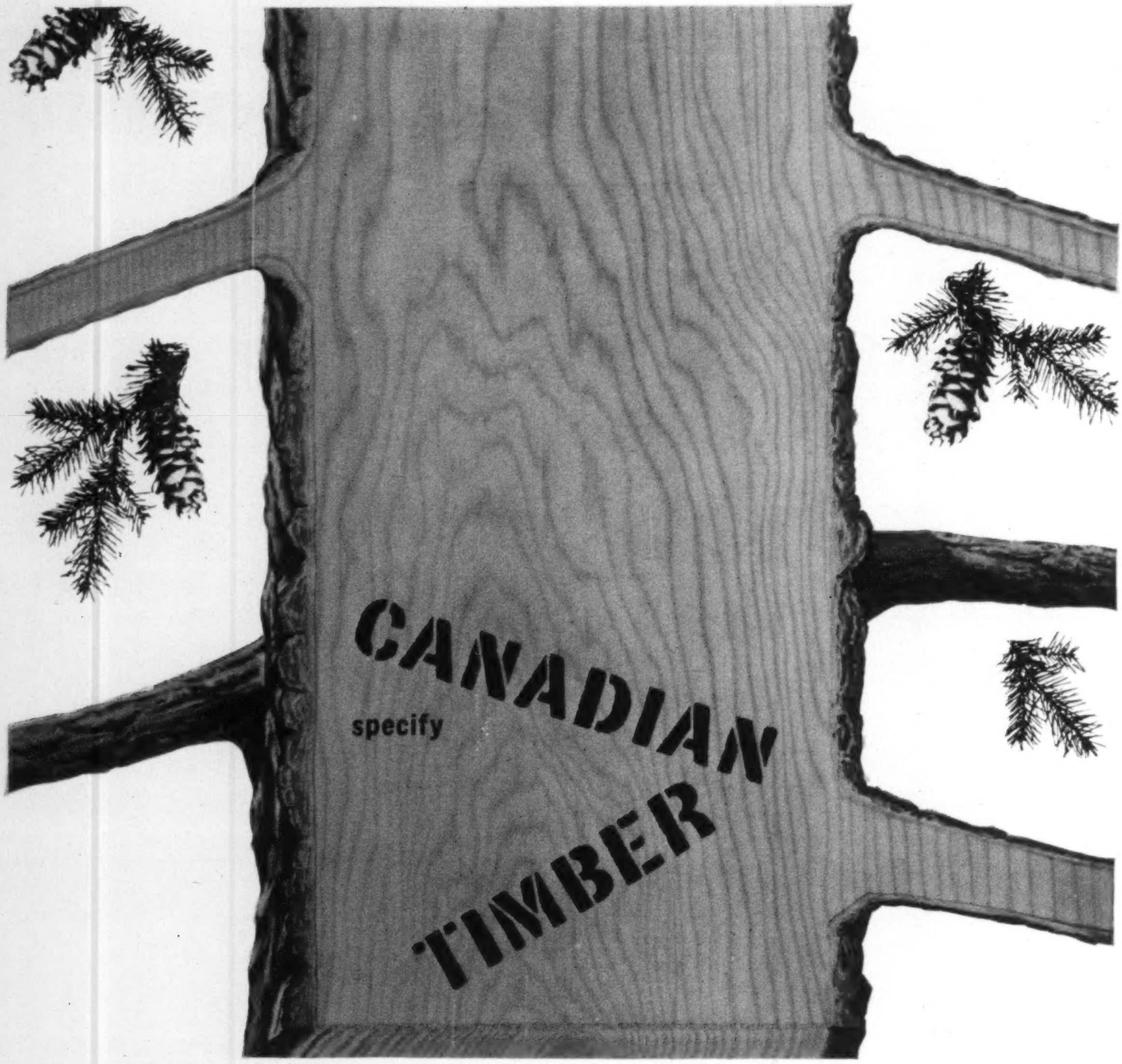

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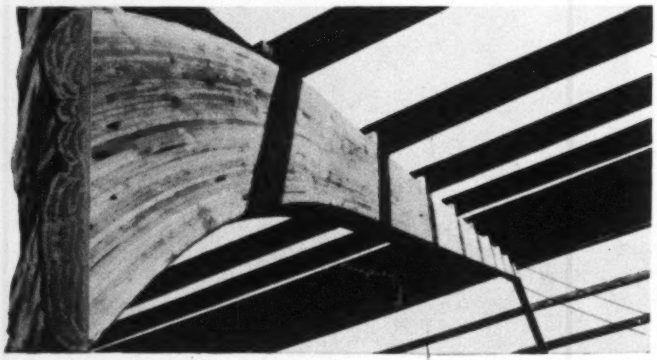

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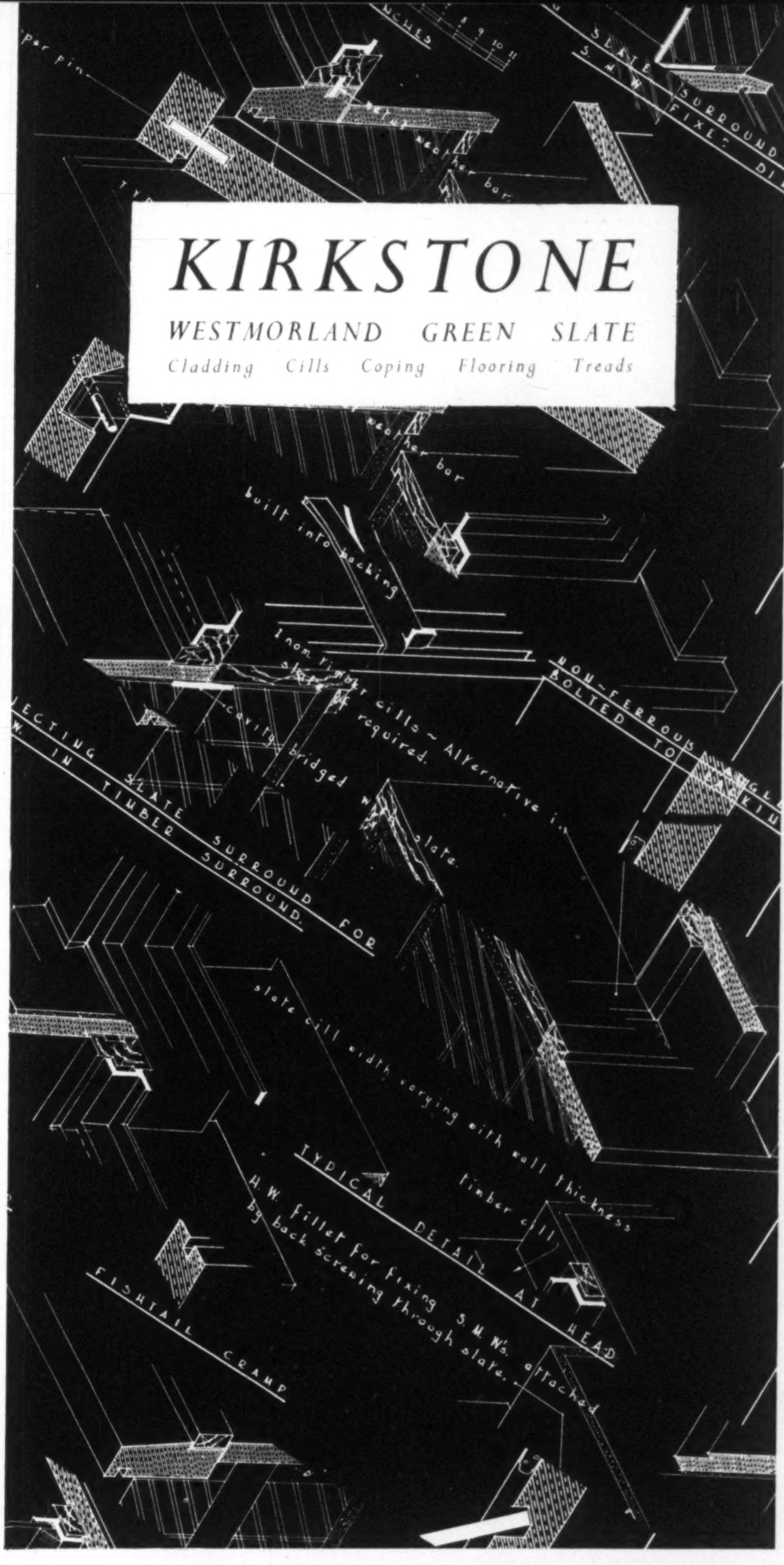
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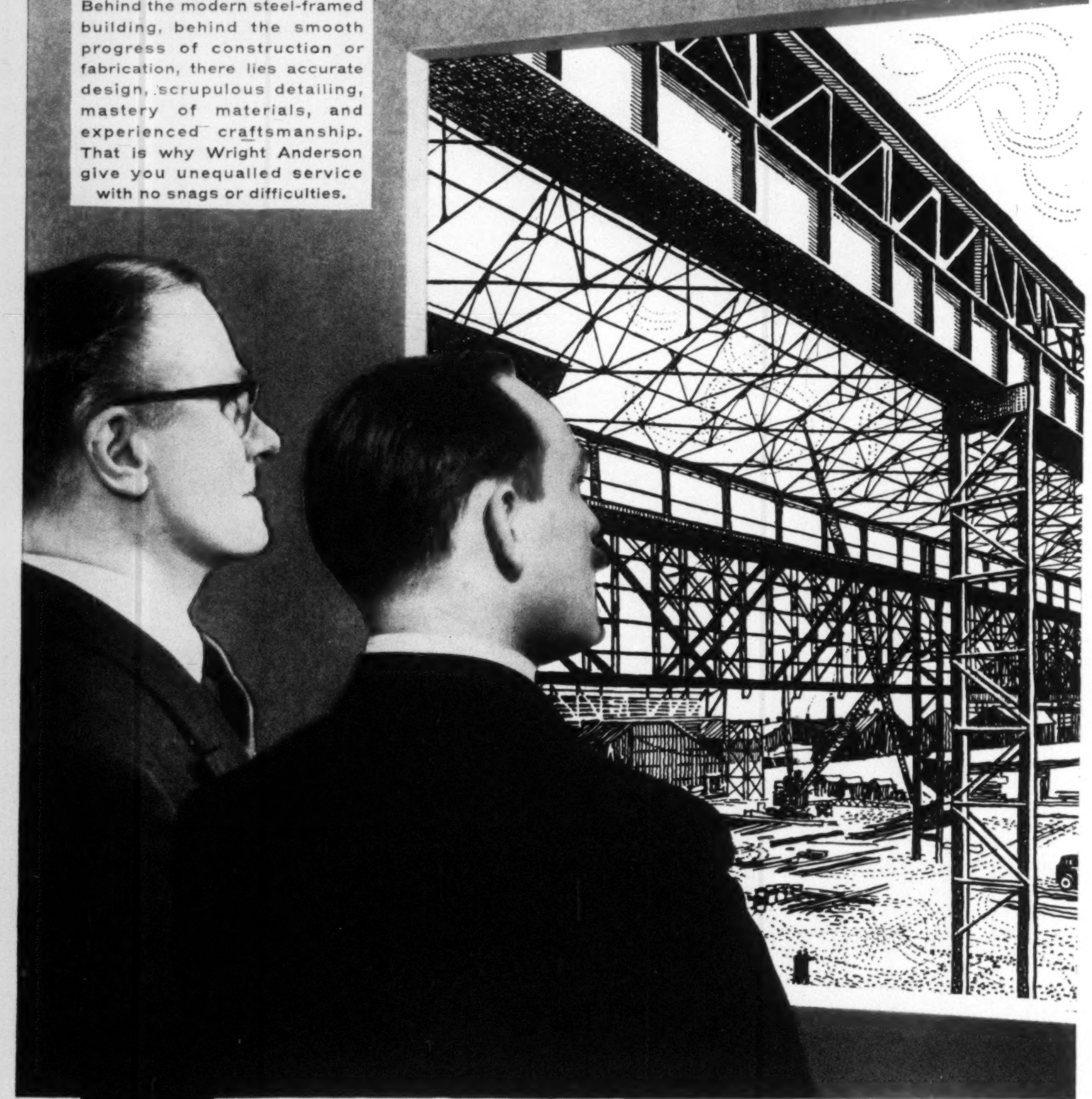

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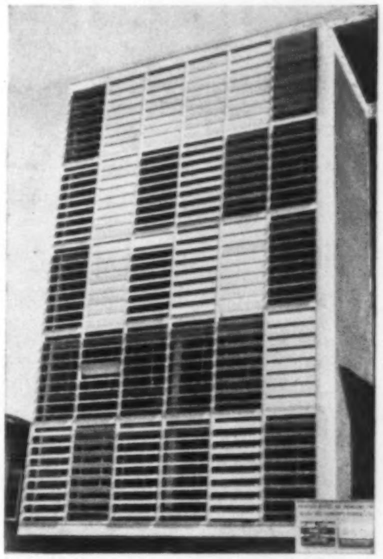

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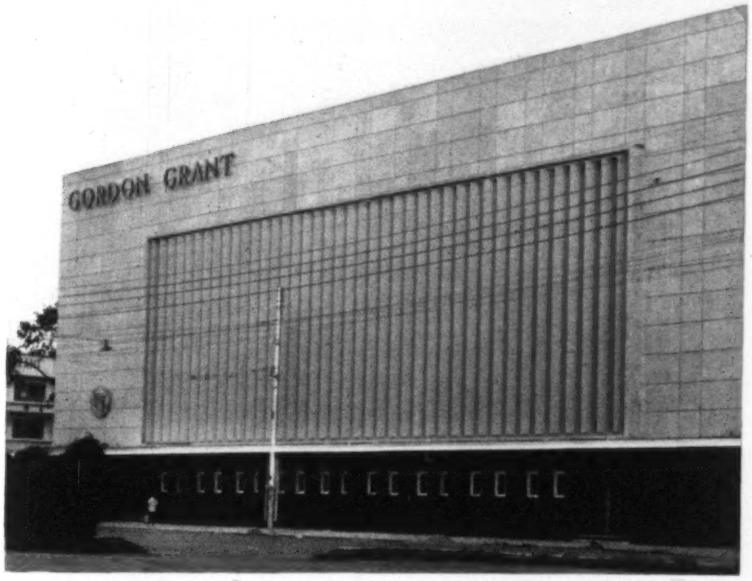

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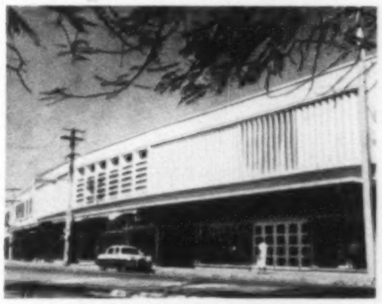

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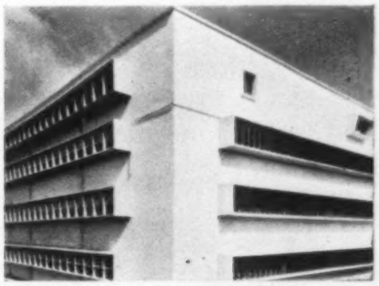

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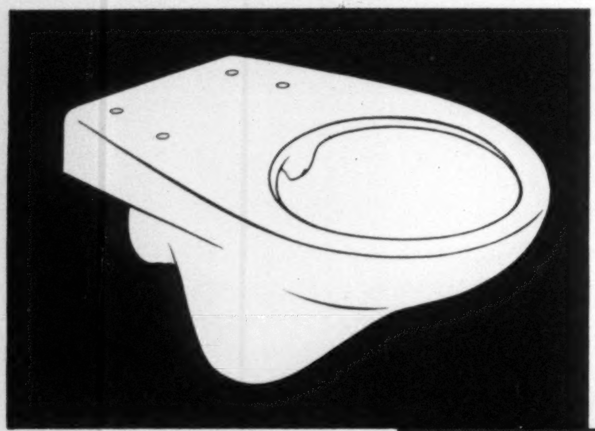

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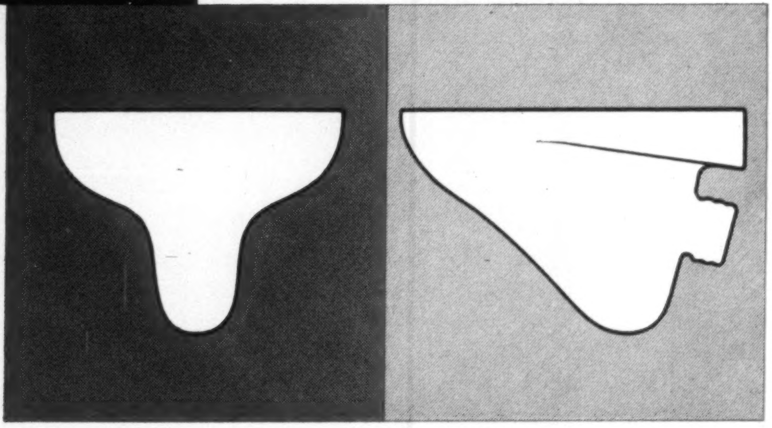

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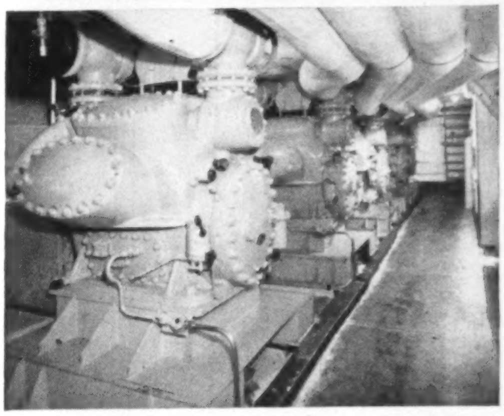

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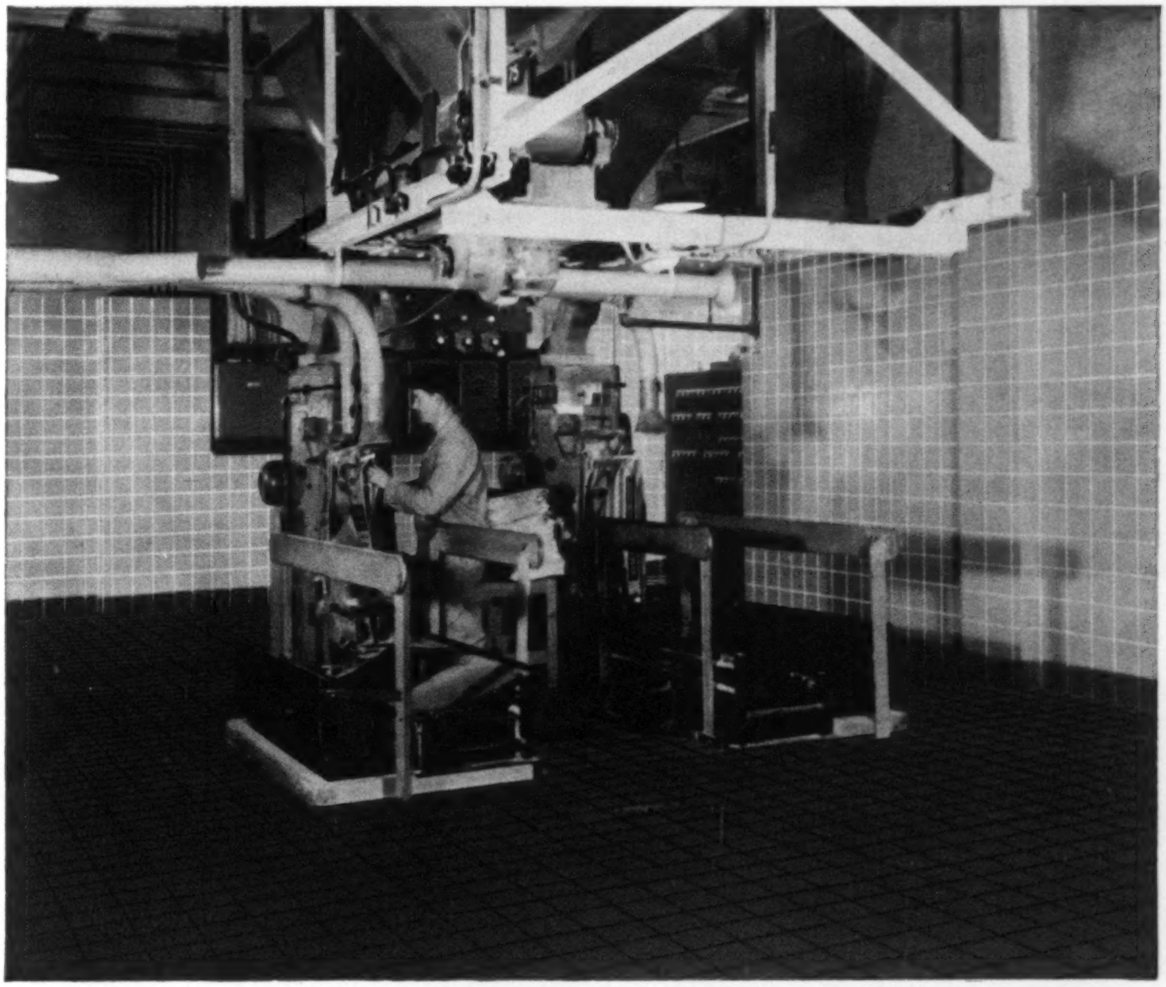

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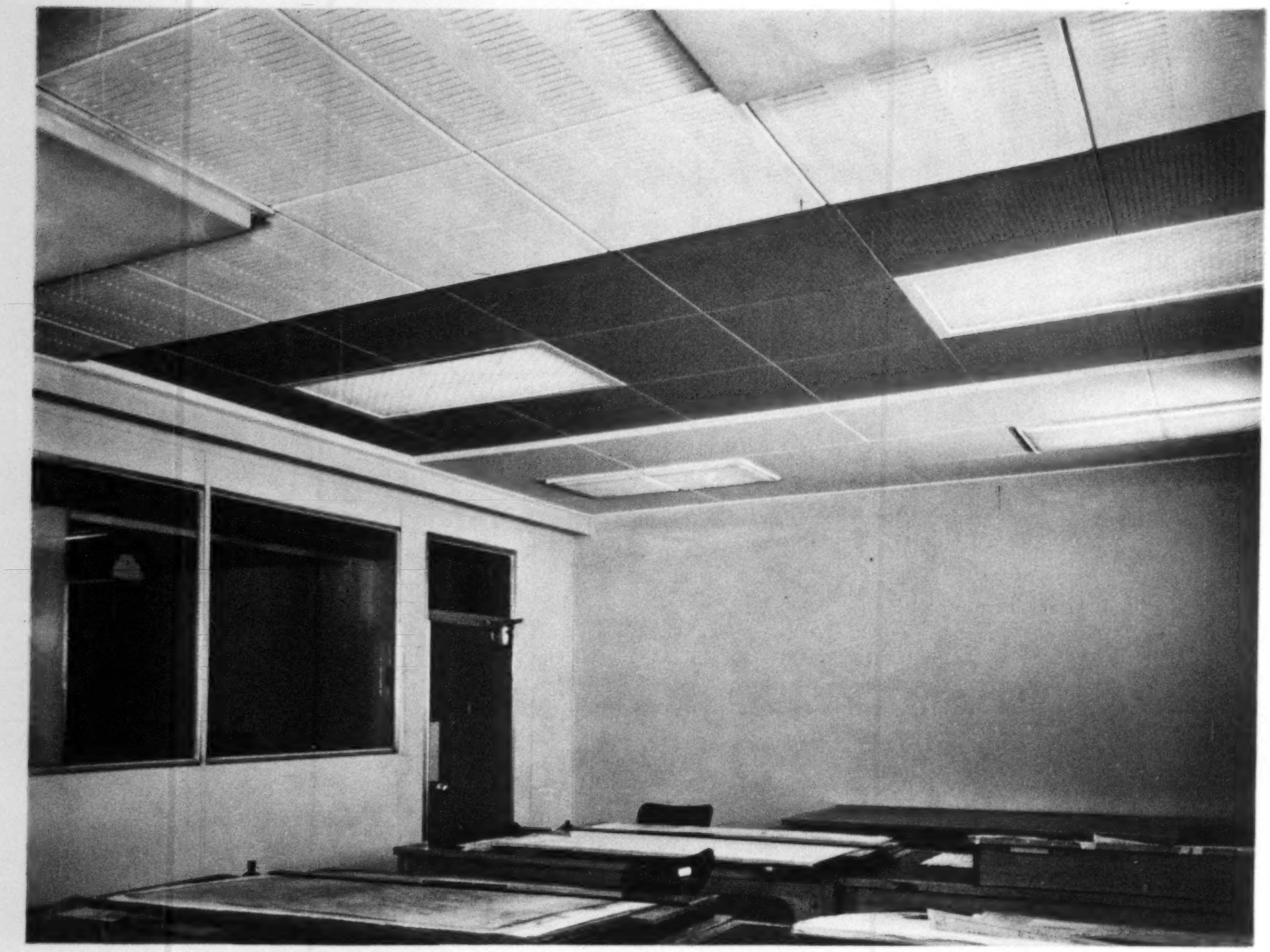

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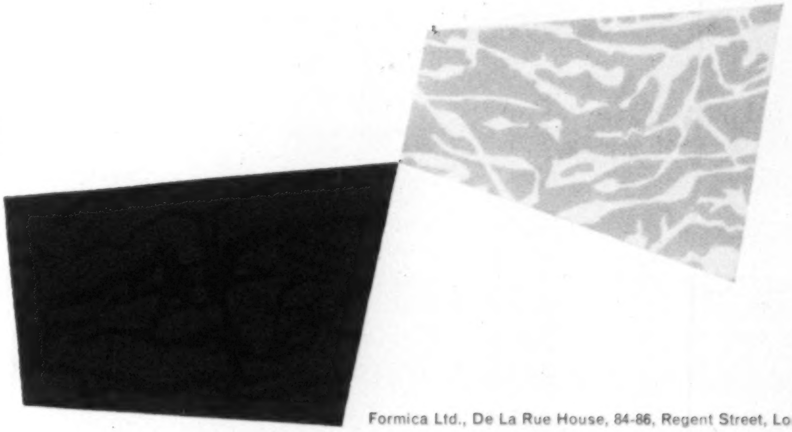

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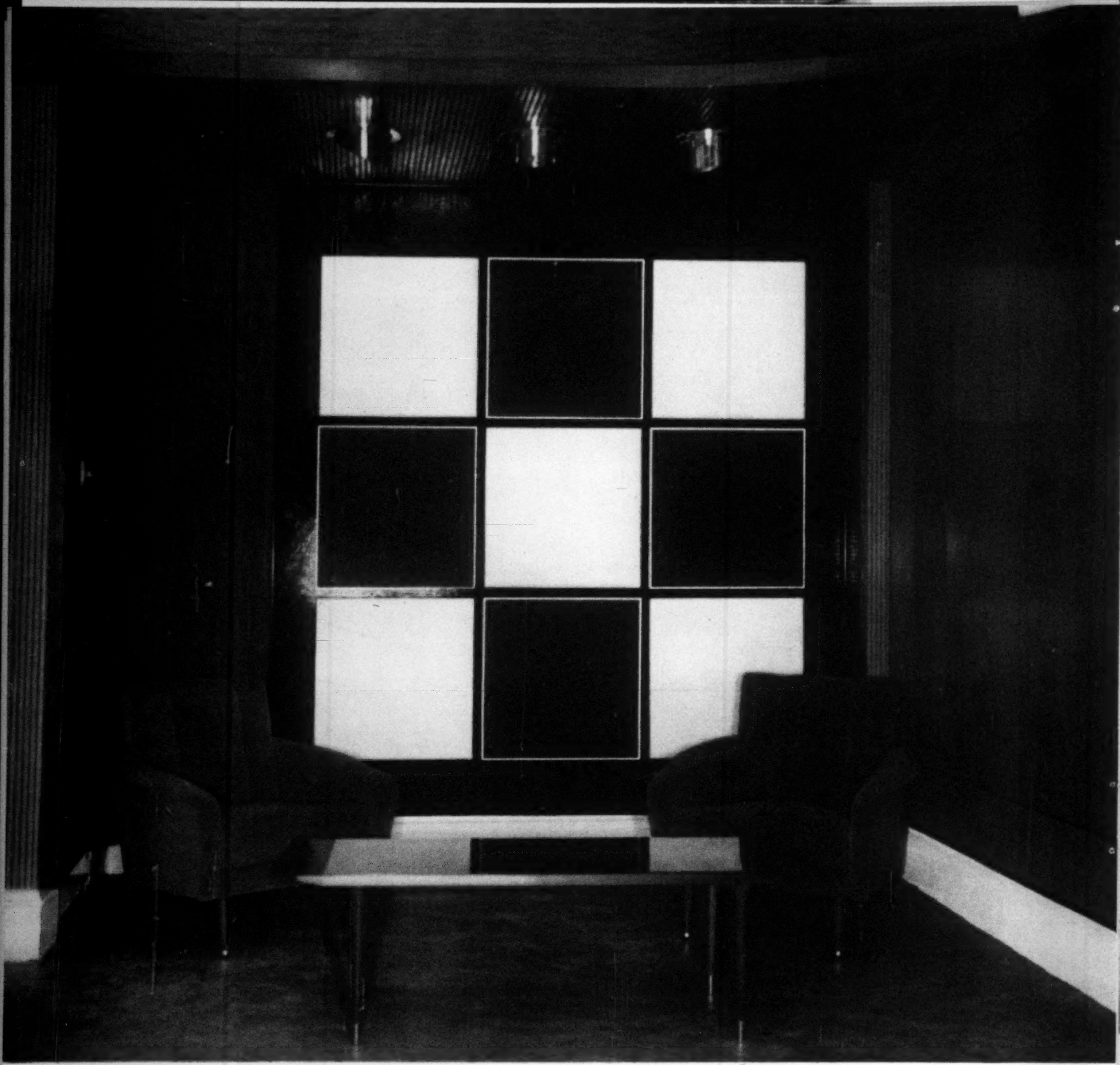

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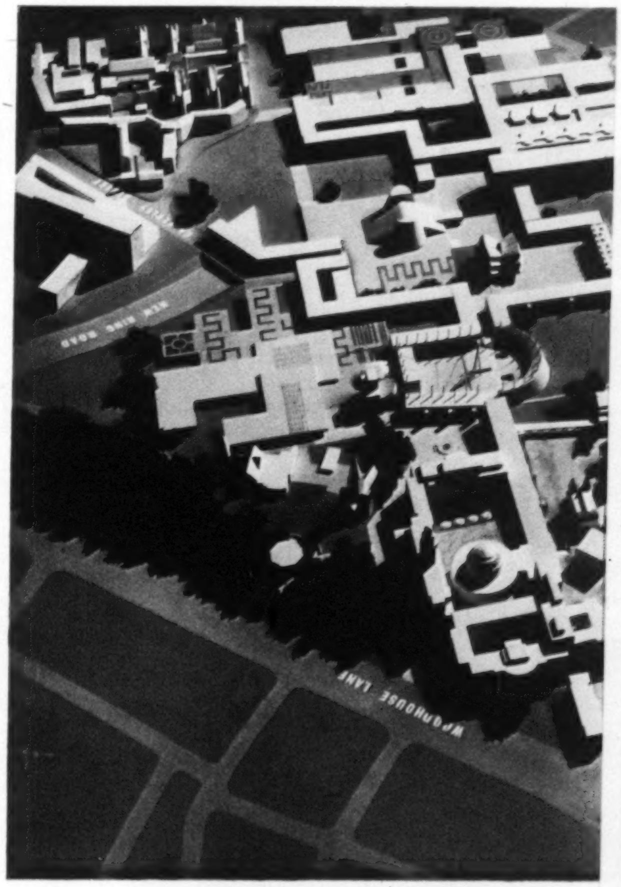
2, the city hall, Hamilton, Bermuda.



1, a model of the University of Leeds development plan.

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Commonwealth 2: Special Issue

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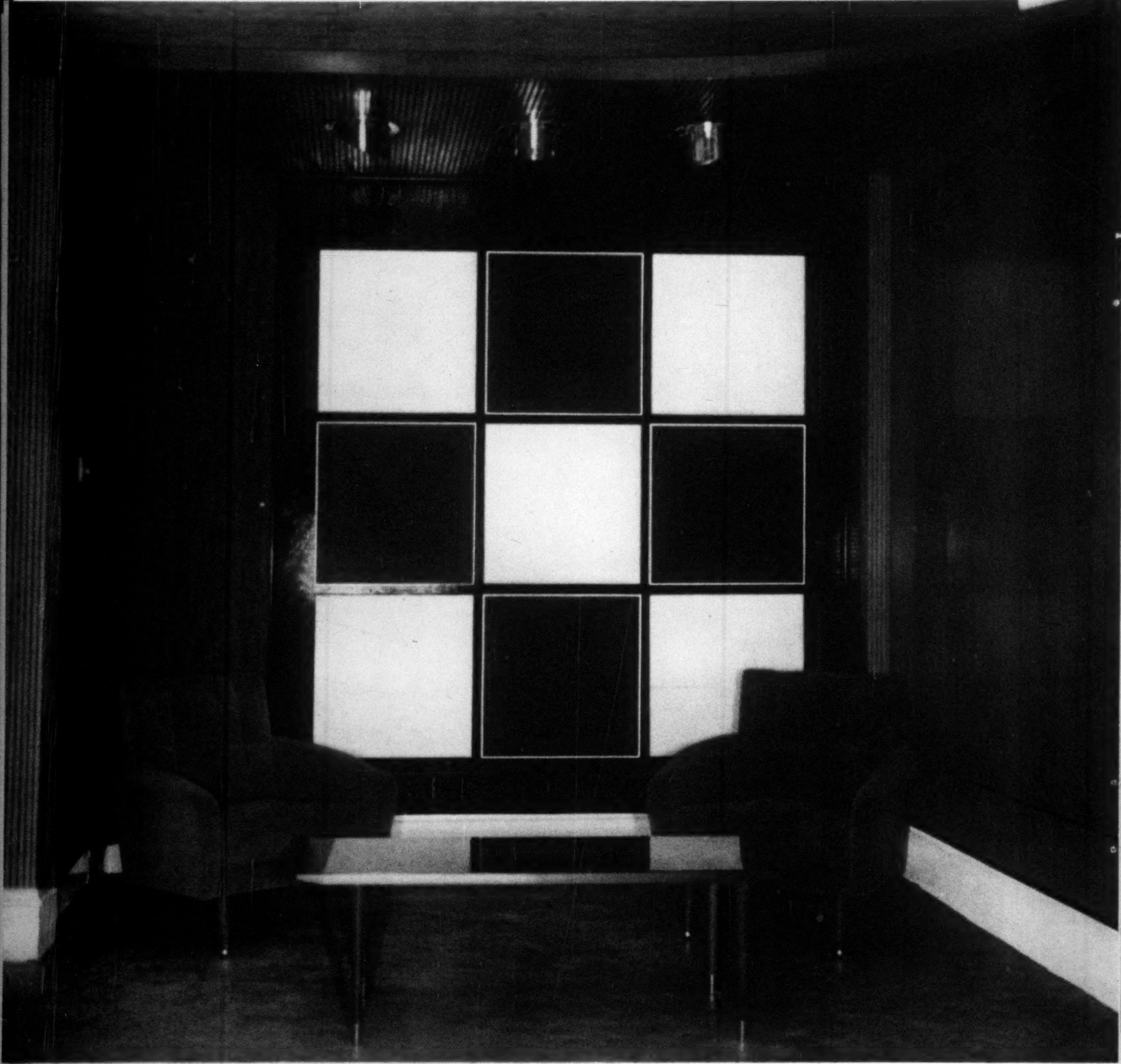

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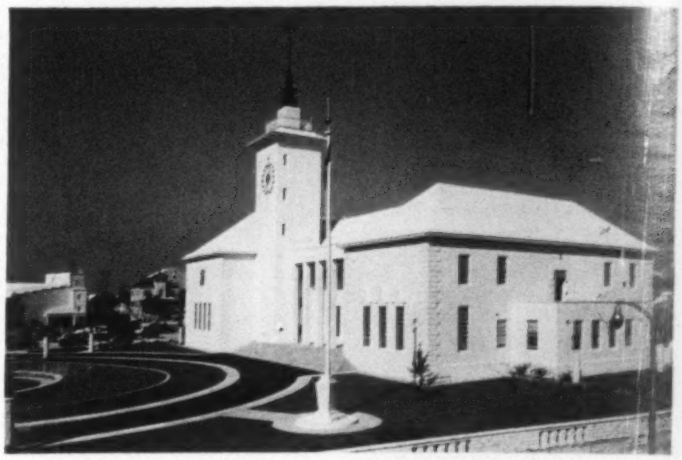

2, the city hall, Hamilton, Bermuda.

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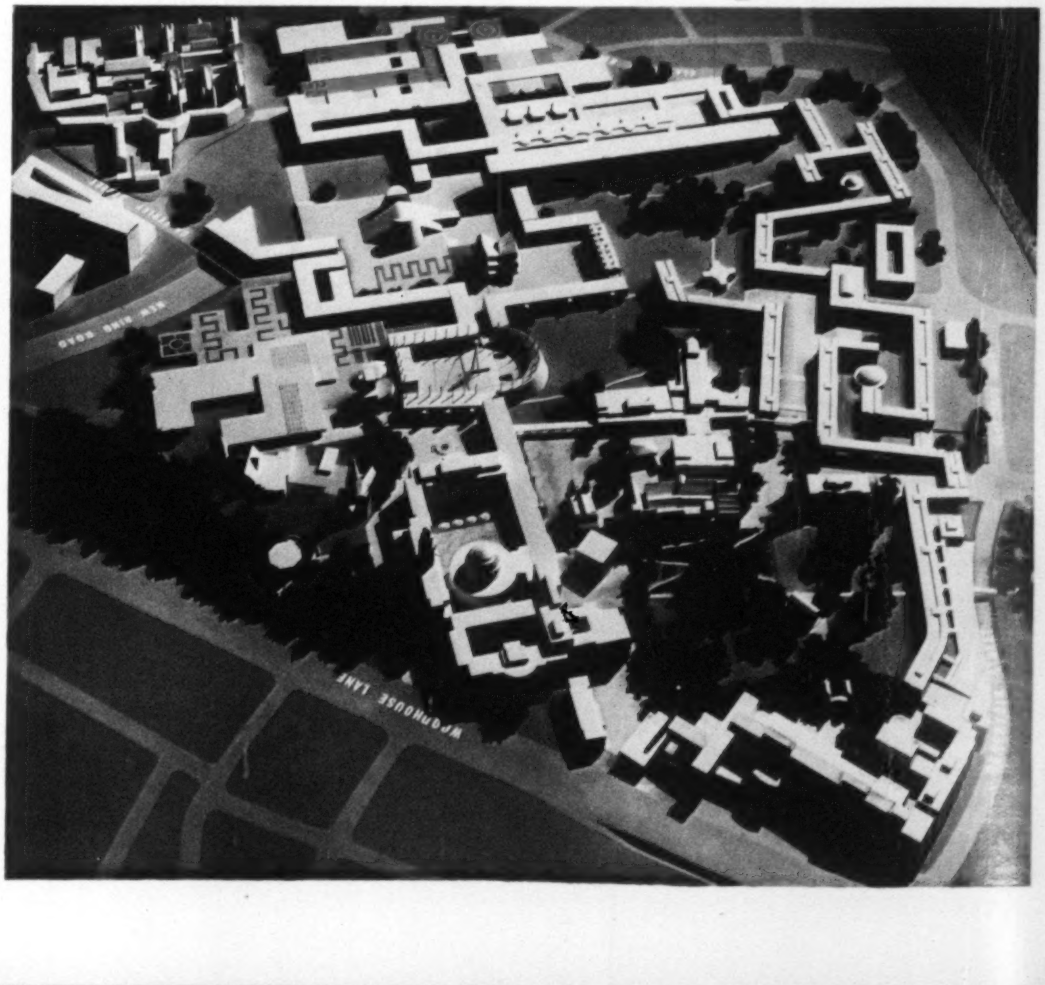
2. *The Board advises that the following architectural styles are acceptable:*
Late Georgian, Colonial style 1800-1860, *Williamsburg style, English Renaissance, and Bermudian style.*

Buildings whose appearance is at variance with the aforementioned styles or is of ultra-modern and eccentric appearance are undesirable. *Conformity with modern requirements should be discreetly executed, without detracting from the style required. Each case will be judged on its merits, but architects are advised to consult with the Board before proceeding with final drawings in all doubtful cases.*

Presumably all cases are doubtful, even those that get built, since most of Bermuda's larger buildings conforming to 'modern requirements' seem to deviate from these stylistic canons. For instance, the new town hall in Hamilton, 2, hopefully described by the Bermuda News Bureau as 'Early Colonial,' has a portico with square columns of a type that Osbert Lancaster long ago identified as the trade mark of totalitarian regimes, while the Island Theatre, left background, suggests that as long as the detailing obeys the letter of the instructions, every corner quoined, it doesn't much matter that the total shape of the building is no kind of late Georgian, Colonial, Renaissance, or Williamsburg—unless that is a rare example of the 'Bermudian' style.

1, a model of the University of Leeds development plan.



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ervation 'Well, that's finished
toriana bit for good.' But, on
it, the *afficionada* will find that
ly-starting students who pro-
Victoriana (Art Society Press,
College School, London; edi-
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properly thought out at all.
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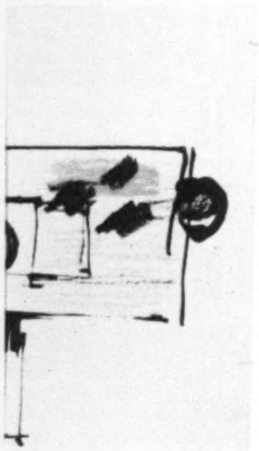

ed in every English house-
Nonsense, declares the Vic-
tudent, nowadays made con-
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ly uncles, and also that
bility was already well set in
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t the art historian, and the
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of the Great Exhibition of

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ngly stops off the Victorian
vell before the Good Queen
t *Victoriana*, most justifiably,
some characteristic samples
Nouveau—something which
nitely is *not* what we usually
Victorian. Yet the bulk of
good in Art Nouveau was
uilt or painted before 1901,
ongs under the *Victoriana*
as surely as pre-Raphaelit-
orian studies, it appears, may
languishing from a lack of
es and an open-minded,
rofessional approach.

EANING OF LARGE
GS

above article (AR, April,
e 283) reference is made to 'a
vindow . . . which spins round
an angle of 180 degrees' when
marked that 'there is evidence
that this easy movement on a
ndow is a source of danger'.
this type of window may
source of danger, there is, in
evidence that accidents have

CORRESPONDENCE

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To the Editors.

SIRS,—First let me congratulate you very much on 'Counter Attack.' The waste of good agricultural land by low density and town sprawl has long worried me.

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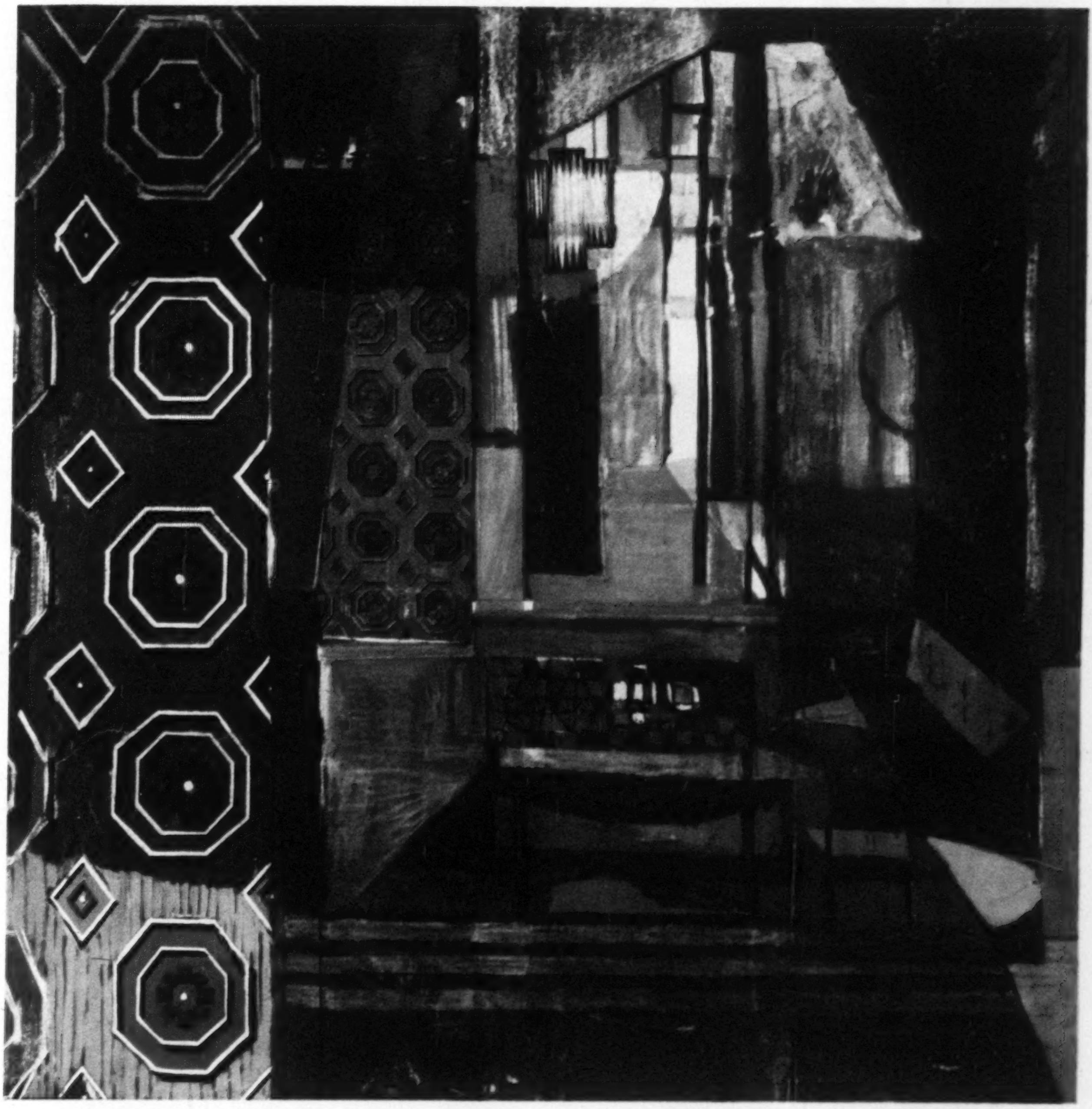

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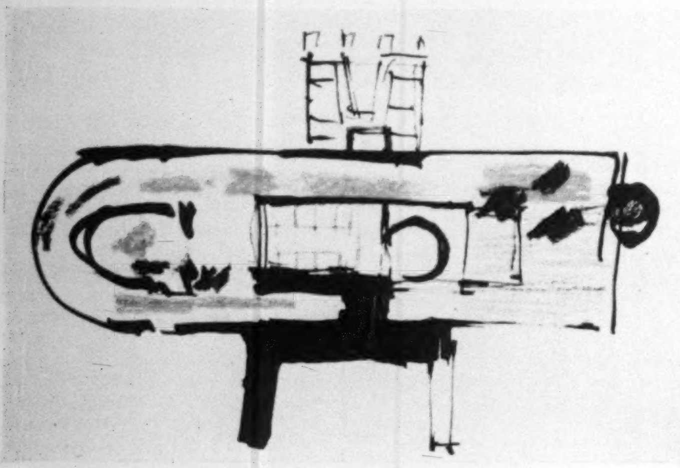
views and reviews

THE TWELFTH TRIENNALE

All being as well as it ever can be with a large and complex international exhibition, the Twelfth *Triennale di Milano*, will open in the middle of this month (July), with, for the first time in its history, a substantial exhibit officially sponsored by the British Government. Some of the background to this achievement, at a time when all hope seemed to have foundered, was given in *Marginalia* for October 1959. Since then, the Board of Trade having failed, in accordance with what is now a tradition, to think of a pretext for sponsoring an exhibit, the Minister of Education has taken over, and Britain will be represented by a three-class infants' school, designed by the Nottinghamshire County architects department (under W. D. Lacey) and built in the system devised by CLASP. Not in itself spectacular architecture, the school—if fully and carefully explained—should make a profound impression by virtue of its ingenuity, low cost, practicability and general air of 'know-how' and will also provide an umbrella for a wide variety of educational, sporting and furniture-trade products, even if the Triennale secretariat's ambition to have live English teaching in progress inside it cannot be realized.

It is not clear yet whether other countries will be sending educational exhibits on this scale (the theme it will be remembered, is *Homes and Schools*) but many of the special exhibits promise to be of exceptional interest, particularly those devoted to the work of individual Italian architects who include, on this occasion, Franco Albini, Figini and Pollini, Lingeri, Michelucci, Carlo Mollino, Quaroni, Mario Ridolfi, and Carlo Scarpa. The graphic design of Triennale publicity material appears to be as good as ever this year, though the symbol on the posters, 3, may cause some bafflement at first. Triennale regulars, however, will recognize it as a rather romanticized version of the plan of Muzio's *Palazzo dell'Arte* which is always the nucleus of the exhibition.



3, symbol from the poster for this year's Milan triennale.

EARLY VICTORIAN STUDIES

A book of Victoriana, produced and published by the Art Society of a boys' school, will probably produce the observation 'Well, that's finished the Victoriana bit for good.' But, on reading it, the *afficionada* will find that the early-starting students who produced *Victoriana* (Art Society Press, King's College School, London; edition limited to 300 copies) have touched on at least two points relative to Victorian studies that have not yet been properly thought out at all.

The very first sentence of the main text reads 'With the accession of the young queen, the dissipation and worldliness of the past were finally stifled, and stern respectability was established in every English household.' *Nonsense*, declares the Victorian student, nowadays made conscious of the survival of the Queen's disorderly uncles, and also that respectability was already well set in by the time the Prince Regent took over. Yet the art historian, and the architectural historian both still tend to think of Victorian as something that came in fairly smartly after Regency, forgetting that—as in domestic morals—there was a long period of transition that had barely finished by the time of the Great Exhibition of 1851.

Conversely, the unthinking distributor of art-historical labels equally unthinkingly stops off the Victorian period well before the Good Queen died. Yet *Victoriana*, most justifiably, includes some characteristic samples of Art Nouveau—something which very definitely is *not* what we usually mean by Victorian. Yet the bulk of what is good in Art Nouveau was made, built or painted before 1901, and belongs under the *Victoriana* umbrella as surely as pre-Raphaelitism. Victorian studies, it appears, may only be languishing from a lack of fresh eyes and an open-minded, not-too-professional approach.

THE CLEANING OF LARGE BUILDINGS

In the above article (AR, April, 1960, page 283) reference is made to 'a type of window . . . which spins round through an angle of 180 degrees' when it was remarked that 'there is evidence to show that this easy movement on a large window is a source of danger'. Though this type of window may prove a source of danger, there is, in fact, no evidence that accidents have occurred

CORRESPONDENCE

GREEN BELTS

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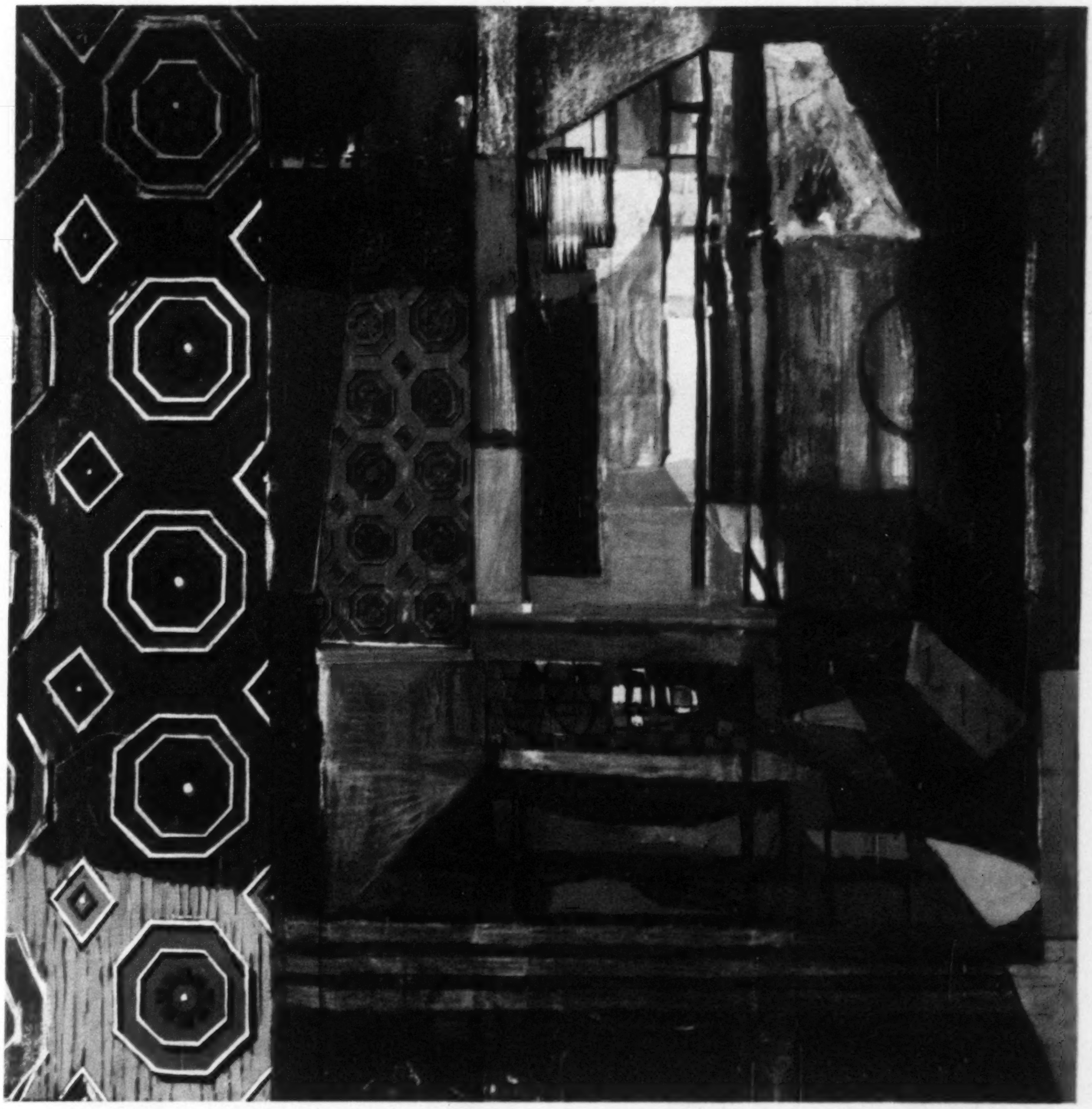

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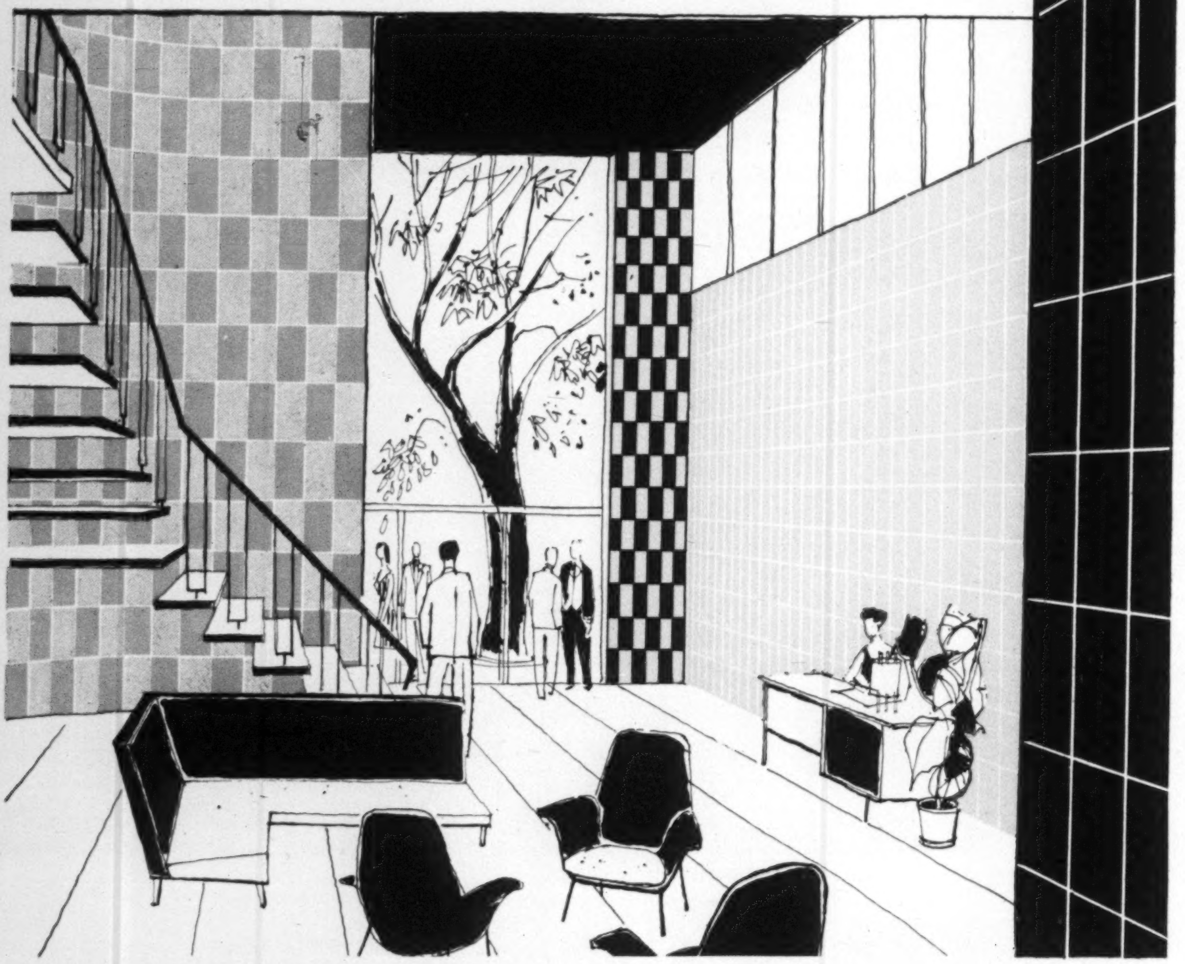

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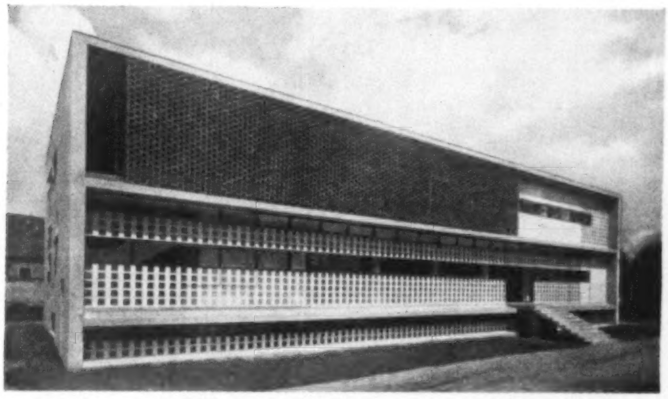
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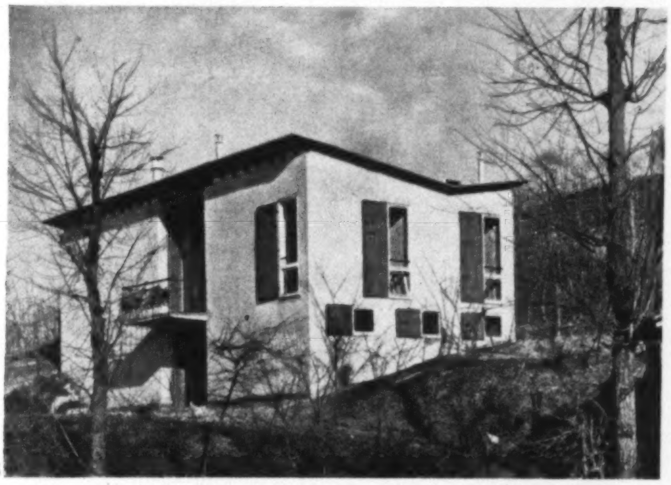
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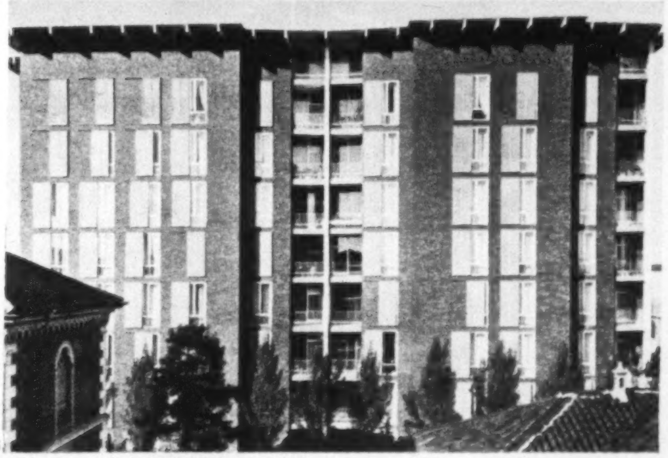
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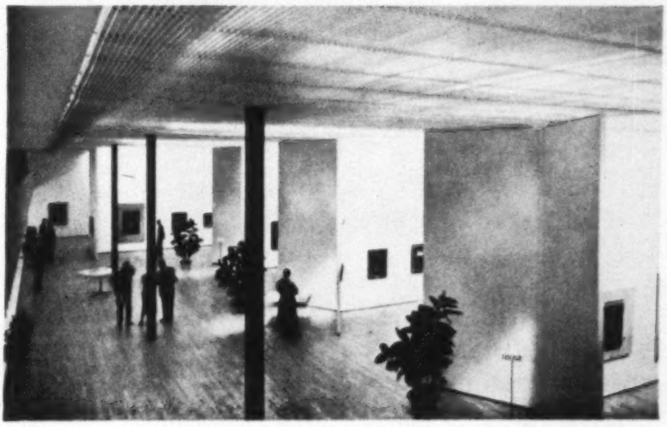
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of socio-cultural double-talk that has been equalled neither by Quaroni's attempt to do the same thing at Matera (for entirely commendable reasons) nor the Neolibertarians (for reasons that still don't bear examination in spite of their mounting bibliography).

Here, if you have to have the place and date, is the point where Italian modern architecture quietly slipped off the rails. But while most of the rest of the train went crashing down the embankment intent on picturesque ruination, Gardella, the pilot engine, had merely gone down a branch line whose ultimate destination may yet prove to be the same as that of the International Modern movement at large. At all events, if some of his subsequent work seems stylistically unsteady and visually insensitive, he has produced at least three buildings of incontestable merit. The Borsalino workers' flats at Alessandria, 6, in which the tall traditional windows reappear, with great subtlety, in association with brick surfaces and polygonal plans (comfortably ahead of the Italian discovery of Aalto), the Gallery of Modern Art in Milan, 7, still the best general purpose gallery in Europe and visually streets ahead of its nearest rival, the new wing of the Stedelijk in Amsterdam, and the house on the Zattere in Venice, 8.

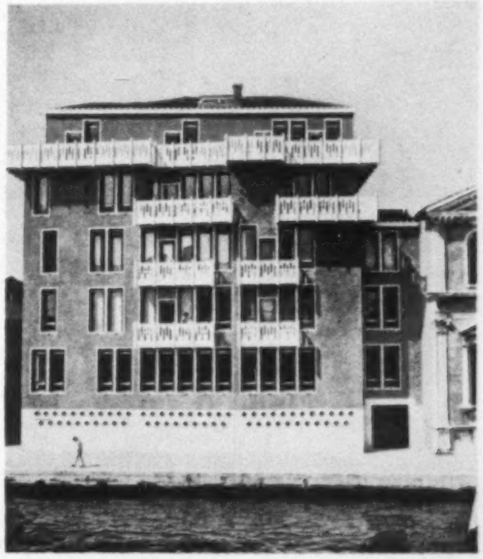
Here, the non-Italian critic finds himself hard put to know what to say. The quality of the building is immediately, unarguably convincing—it is right for its site, in spite of defying all the rules that an English amenity society or a Neolibertarian theorist might devise for 'keeping in keeping' with an *ambiente pre-esistente*. Faced with a history-loaded situation in which even Frank Lloyd Wright could only make gestures of vulgar defiance, Gardella has responded, as far as one can see, by *inventing a vernacular*—the building's most conspicuous virtue is to look like a conversion job at first sight, and then reveal somewhere between second and seventh sight, that it is basically a masterpiece of the stylist's art.

Clearly, everybody faced with a similar problem needs to know and understand this building, but how much they will learn from Professor Argan's introduction, I don't know. He discusses it at some length, but in his usual knotted and abstract style, touching on a number of interesting problems, but most of them at least two removes from the building itself. However, the running text and captions—presumably the work of Pier Carlo Santini—stick to the facts of structure, materials and finishes, and thus provide the starting point for thinking one's way into the building from the opposite end to Argan, so to speak. Any architect who is going to have to design a new building in an old environment should start on both texts at once and see at what point he meets himself coming from the other end, and then think very hard because—I am convinced—there is an extremely important lesson to be learned here, and it won't be learned by imitating the style of the building.

P.R.B.

BOOKS RECEIVED

EVERYMAN'S CONCISE ENCYCLOPAEDIA OF ARCHITECTURE. By Martin S. Briggs. Everyman's Reference Library. 21s.
ROYAL PAVILION. By Clifford Musgrave. Leonard Hill. 50s.
CONVERSATIONS SUR L'ARCHITECTURE. By André Gutton. Editions Vincent Fréal et Cie.
THE STATUS SEEKERS. By Vance Packard. Longmans. 21s.
INTERIORS BOOK OF OFFICES. Edited by Lois Wagner Green. Whitney Publications Inc., 18 East 50 Street, N.Y.22. $12.50.
SCHOOLHOUSE. Edited by Walter McQuade. Simon & Schuster. $10.00.
THE ENGLISH TRADITION IN DESIGN. By John Gloag. A. & C. Black Ltd. 25s.
MADE IN NEW YORK. Edited by Max Hall. Harvard University Press, Cambridge 38, Mass. 54s.
PRINCIPLES OF MODERN BUILDING. DSIR. HMSO. 20s.
WAGES IN THE METROPOLIS. By Martin Segal. Harvard University Press. $4.75.
MODERN EUROPEAN ARCHITECTURE. By A. Dorgelo. Elsevier Publishing Co. 152s.
INTERIORS IN COLOUR. By Roger Smithells. B. T. Batsford Ltd. 35s.
CORIPPO. By T. Amsler, D. Herrman, K. Lohrer, B. Pedolin and U. Weber. Verlagsanstalt Alexander Koch GmbH, Stuttgart. 35DM.
STUDIES IN LANDSCAPE DESIGN. By G. A. Jellicoe. Oxford University Press. 25s.
RESIDENTIAL RENEWAL IN THE URBAN CORE. By Chester Rapkin and William G. Grigsby. Oxford University Press. 30s.
COLOUR IN INDUSTRY TODAY. By Robert F. Wilson. Allen & Unwin. 35s.
THE URBAN COMMUNITY. By Nels Anderson. Routledge & Kegan Paul. 35s.
LITURGY AND ARCHITECTURE. By Peter Hammond. Barrie & Rockliff. 37s. 6d.
TOWARDS A HABITABLE WORLD. By J. van Ettinger. Elsevier Publishing Co. 55s.
BYGGE-ORDBOG. By Ruth Bredsdorff. Nyt Nordisk Forlag. 26.50 cr.
MATISSE FROM THE LIFE. By Raymond Escholier. Faber & Faber. 63s.
PILKINGTON BROTHERS AND THE GLASS INDUSTRY. By T. C. Barber. George Allen & Unwin Ltd.
THE CONSTRUCTION OF BUILDINGS. By R. Barry. Crosby Lockwood & Son, Ltd.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Some of the illustrations from Gardella, *reviewed on this page.*
4, tuberculosis clinic at Alessandria (1938).
5, house at Castana (1946).
6, flats at Alessandria (1951).
7, Gallery of Modern Art, Milan (1953).
8, house in Venice (1957)

Startling changes in long established topographical patterns are taking place in all quarters of the world as the tropical areas of the British Commonwealth—hitherto largely undeveloped—emerge into nationhood, sophistication and the first stages of industrialization. Above is Hong Kong, looking across the island city, where buildings on an unprecedented scale can be seen rising among the old, to the harbour beyond. Hong Kong is one of the territories dealt with in this special issue, devoted to illustrating new architectural developments in the tropical areas of the Commonwealth. The photograph is by Mr. Roy Tsang.

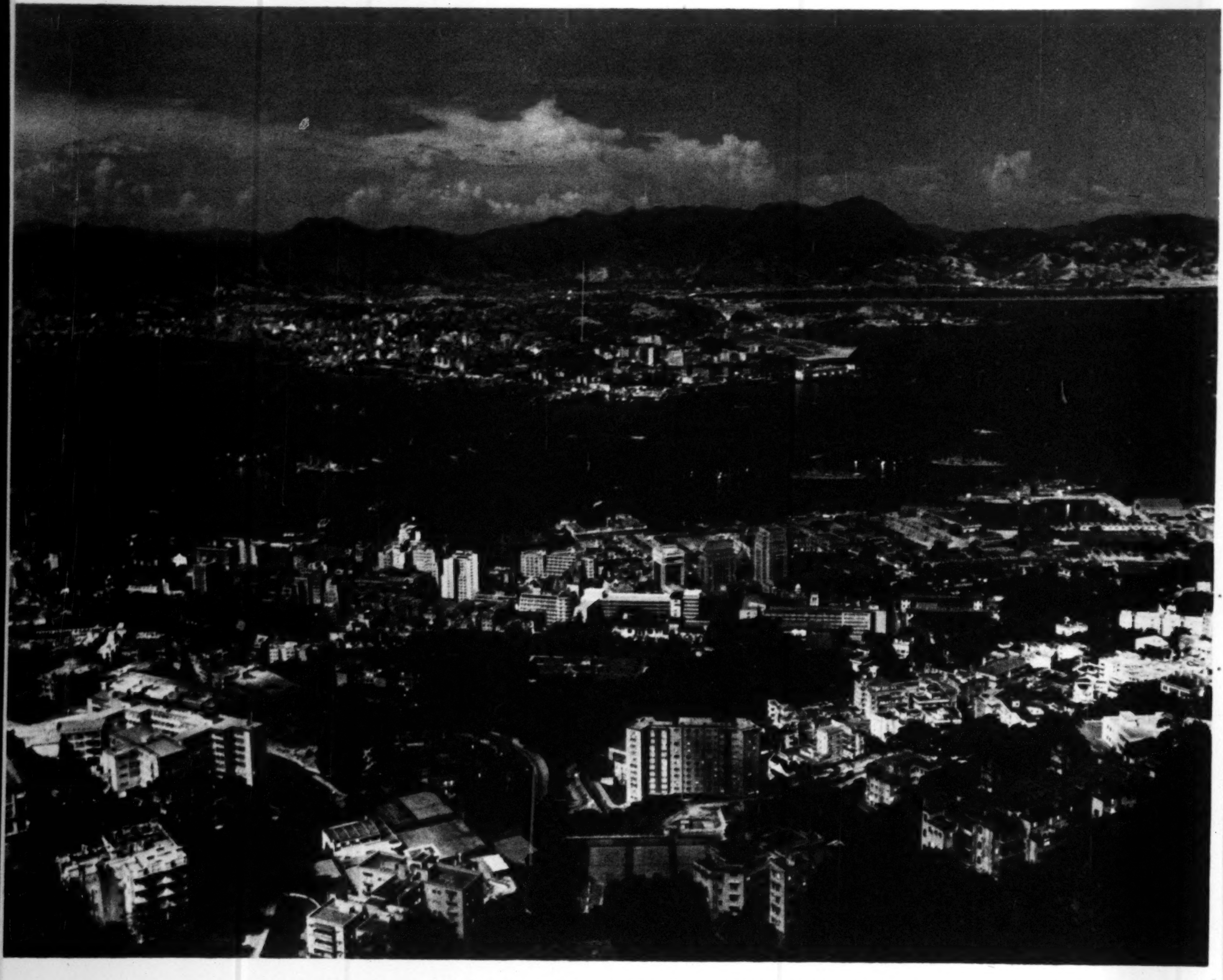
COMMONWEALTH 2

This is the second of two special issues of THE ARCHITECTURAL REVIEW designed to give a picture of architecture in the British Commonwealth today. The first, published last October, dealt with the four large Dominions: Canada, South Africa, Australia and New Zealand—all, roughly speaking, in the temperate zone. This issue deals with the remaining Commonwealth territories, all of which lie, in a general climatic sense if not wholly so in the strictly geographical sense, within the tropics.

Apart from catering for tropical rather than temperate climates, the architecture illustrated this time differs in several ways from that of the four Dominions. On the whole the tropical territories are the less developed areas of the world; they are inhabited by colonial or ex-colonial peoples vigorously emerging into nationhood and faced, while they do so, with the problem of assimilating European techniques and ideas of progress. By contrast, the Dominions share the same technical standards, the same degree of industrial development and architectural sophistication, as Europe and America. Theirs is an old civilization translated to wider spaces, not a new one based on differences of race and climate and culture.

It follows that the buildings illustrated in the first Commonwealth issue were designed, as in any European country, by local architects for the most part locally trained. In the case of this second issue the position is very different. Although in due course each territory will no doubt become self-sufficient architecturally, for most of them this will be a long process, and they are only now beginning to acquire their own architectural professions and architectural schools. Not till they have done so, perhaps, can they expect to achieve a consistent architectural style recognizably their own.

Most of the buildings illustrated here were either designed in England by English architects (as in the case of many of those in West Africa) or designed by architects of English origin, largely trained in England or America, who practise locally. Their practices are often fairly newly established, but in several localities, such as Singapore and Hong Kong, large buildings in a purely western style have been dominating the skyline for



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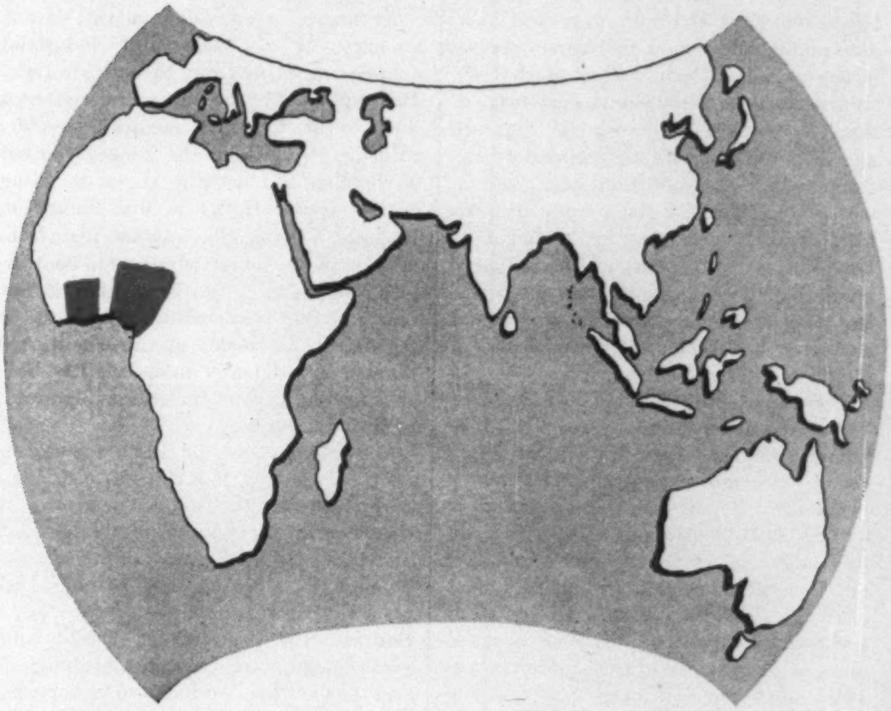
Most of the buildings illustrated here were either designed in England by English architects (as in the case of many of those in West Africa) or designed by architects of English origin, largely trained in England or America, who practise locally. Their practices are often fairly newly established, but in several localities, such as Singapore and Hong Kong, large buildings in a purely western style have been dominating the skyline for several generations, and the newer, more modern, architecture is the work of the successors of the Western-trained architects who designed them. In these cities, however, there also now flourish firms of Chinese and other native architects, and before long no doubt native African architects will be putting up important buildings in East and West Africa and West Indian architects in the Caribbean. India is an example, from among the countries represented here, of one in which every building illustrated (except for the rather specialized case of Chandigarh, and of Le Corbusier's work elsewhere) is the work of native Indian architects.

The progress towards architectural self-sufficiency is one of the subjects touched upon in the articles that introduce each section of this issue—articles written for the most part by architects resident in the territory dealt with or who, like Mr. Fry in Ghana, have done work there over a long period. These articles also touch on such matters as climatic and social conditions and the availability of materials and skilled labour, some knowledge of which is required for the purpose of understanding which qualities of the architecture shown arise from internal causes and which from outside influences, and why the architecture of the various territories has much in common but many points of difference.

In each section the buildings illustrated have been chosen to give a picture, as far as the space available allowed, of the most interesting work that has been done in each tropical territory of the Commonwealth in the last few years. Where a building has already been illustrated in the REVIEW only a small reminder picture is included. The final choice of examples is that of the Editors of the REVIEW, but they have been greatly helped by the architects in each territory who made a preliminary choice on their behalf and collected together photographs and plans. The Editors are indebted to the following for performing this task: Mr. John Godwin (of Godwin and Hopwood) in Nigeria; Mr. B. G. White and Mr. A. E. Crocker in Ghana; Mr. R. B. Browning and Mr. Richard Hughes in East Africa; Mr. P. O. Coltman in Northern Rhodesia; Mr. Lloyd Spencer in Southern Rhodesia; Mr. J. C. Rose (assisted by Mr. J. C. Walker and Mr. P. M. Stevens) in the Caribbean; Mr. J. Posener in Malaya; Mr. J. L. Middleton and Mr. Lincoln Page in Singapore; Mr. Peter Morley in the East Indies; Mr. Eric Cumine and Mr. Stanley Kwok in Hong Kong; Mr. F. W. Smith in Fiji. Thanks are also due to the numerous architects who have provided material illustrating their own work, and to Mr. George Atkinson of the Tropical Building Section of the Building Research Station, who has given invaluable help and advice.

E. Maxwell Fry



WEST AFRICA

What we call West Africa is a long strip of land lying between the South Sahara and the South Atlantic Ocean, comprising the one-time colonies and dependencies of Britain, France and Portugal. It is a fringe of rain forest that tapers off northward and westward. Until the last war it was a place known chiefly to traders, missionaries and the small number of officials that administered it. Its emergence into the full current of world affairs, and of its component countries into independence, is an effect of accelerated communication, due largely to war. Even before the end of the war Parliament had voted £200 millions under the Colonial Development and Welfare Act, enabling the earliest start to be made on the education, in the widest sense of the word, of peoples who had hitherto been entirely subservient to the primary producing needs of dependent colonies.

This defines the political attitude of Great Britain towards these countries. It also indicates their emotional response to the situation and explains the rapid technical advances made: not rapid enough for the peoples concerned, but appearing too rapid to many an outside observer.

In 1944, when Jane Drew and I started planning and building in West Africa, little of this was apparent. India was still a dominion, and the Empire was virtually intact. Nevertheless, the change was in the air, and my own attitude to our work was that it was an instrument of introduction to European life and thought. For good or ill a decision had been made by both parties to the affair. There was no question of turning back on any tracks. It was a matter of making the most of the situation given. It was a matter, more precisely, of planning tropical towns for modern life in the fullest sense of the term: of building schools and universities for an unrestricted range of education; and in all this of foreseeing an advance on the widest technological front. At the outset the impediments to carrying out a large programme of buildings were formidable. The building industry consisted of a few under-organized and badly equipped firms using illiterate but not unintelligent local workmen. It needed, and without question accepted, the regulating machinery current in more highly developed countries—a detailed building agreement, cost accountancy as understood by quantity surveyors, payment by measurement on accurate and detailed architects' and engineers' drawings, expert supervising.

The main interest for architects lies elsewhere, and concerns the application of CIAM principles and methods to comprehensive problems of tropical architecture and planning. It is on that score that the achievement in West Africa will be measured. It concerned first the needs of the people, which in the first few years came to us all in terms of education, and secondly it concerned climate, which I have come more and more to respect as a determining factor of architecture, because it has already determined so much else, from agriculture to the habits, customs and finally religions of peoples who live dependant upon it. When we study climate we are seeking an accommodation with nature; we are searching for the particular form from amid the general order of things, in hopes of fashioning what will be uniquely applicable to conditions as we see them. In doing so we are creating a regional character answerable to local needs, a dialect of internationalism.

The climate of the populous areas of West Africa is intensely tropical—hot, humid, rainy and insect-ridden, with fast growing vegetation, and the critical factor is humidity measured in terms of its effect on body heat-loss; or, put another way, on the cooling effect on the skin of moving air. To meet this condition buildings must generally be no more than one room thick and their construction must offer the minimum of obstruction to the passage of air. They must also be shaded from sun and protected from driving rain, and the quality of the moving air must be enhanced by the presence of vegetation. There are many other considerations, among the first of which is the necessity for orientation to keep sun off walls, to turn away from storms and—most important—to face into the breeze. Most of these conditions can be evaded by using air-conditioning, but without absolving the architect from his preoccupation with climate, since the expense of air-conditioning makes it most sensitive to heat gains within the envelope, varying as they do with the daily passage of the sun across the building. The conditioning system already suffers from the costly necessity of extracting humidity by refrigeration and can afford no further overload whatsoever.

So, therefore, climate presses from all directions, and few architects in any of their works have successfully dealt with them all. But they have developed a common attitude to the obsessing problem. The solutions in terms of building have changed enormously over fifteen years. The predominant building material of West Africa was, and perhaps still is, mud, which under the conditions of tribal life and economics, with its perpetual renewal through communal effort, was entirely appropriate. Under a system of cash-economy it becomes immediately expensive, no matter now low its original capital cost. This is one of the deplorable effects of the division of labour; one among many. The dominance of maintenance faces us also with our enemies the insects. Tribalism could tolerate them and mend and make do, but we must fight the termite and ant as we fight the anopheles mosquito, must resist fungus and corrosion and call on our armoury of scientific and industrial weapons in an attempt to outwear time. This explains why we jumped to reinforced concrete at the first moment possible, reducing everywhere the timber content of building and denying access to flying insect hordes. If, as in our library in Ibadan, Nigeria, an interior free from insects and a fabric offering no nourishment for termites can be created at low cost, a victory over circumstances has been registered. To make an air-conditioned library, as originally intended, has been shown to be beyond the reasonable means of such a university.

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African life needs a different pattern, of different houses, than elsewhere. Its needs are peculiar and unique. They have been studied in detail by anthropologists and others, but unless the status of town-planning is improved and responsible researches undertaken rapidly, all this will go by default and towns will be built, or grow congested, with no directing impulse arising from knowledge of the conditions. Cheap housing, as we found in India, is of all architecture the most difficult to create, and even so cannot be considered apart from town-planning. What is important is not the individual unit but the life cycle of which it is a part. I am not suggesting that town-planning is not being used. There is evidence of serious planning in many centres. The point I make is that at the rate of development in West Africa it should be given a still greater importance and the means of dealing with existing property because of the incalculable benefits it will confer upon the changing lives of the people.

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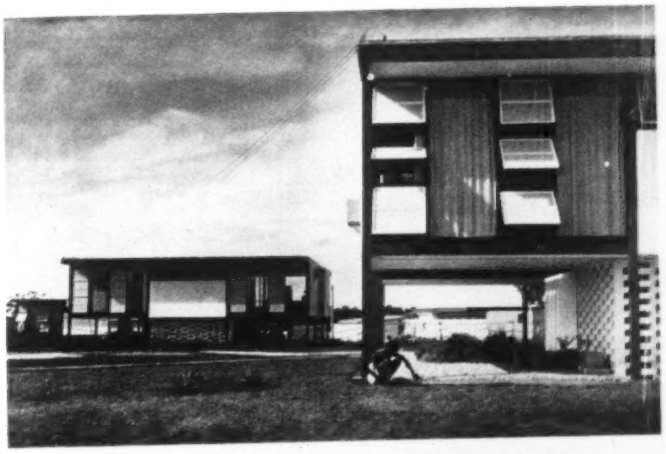
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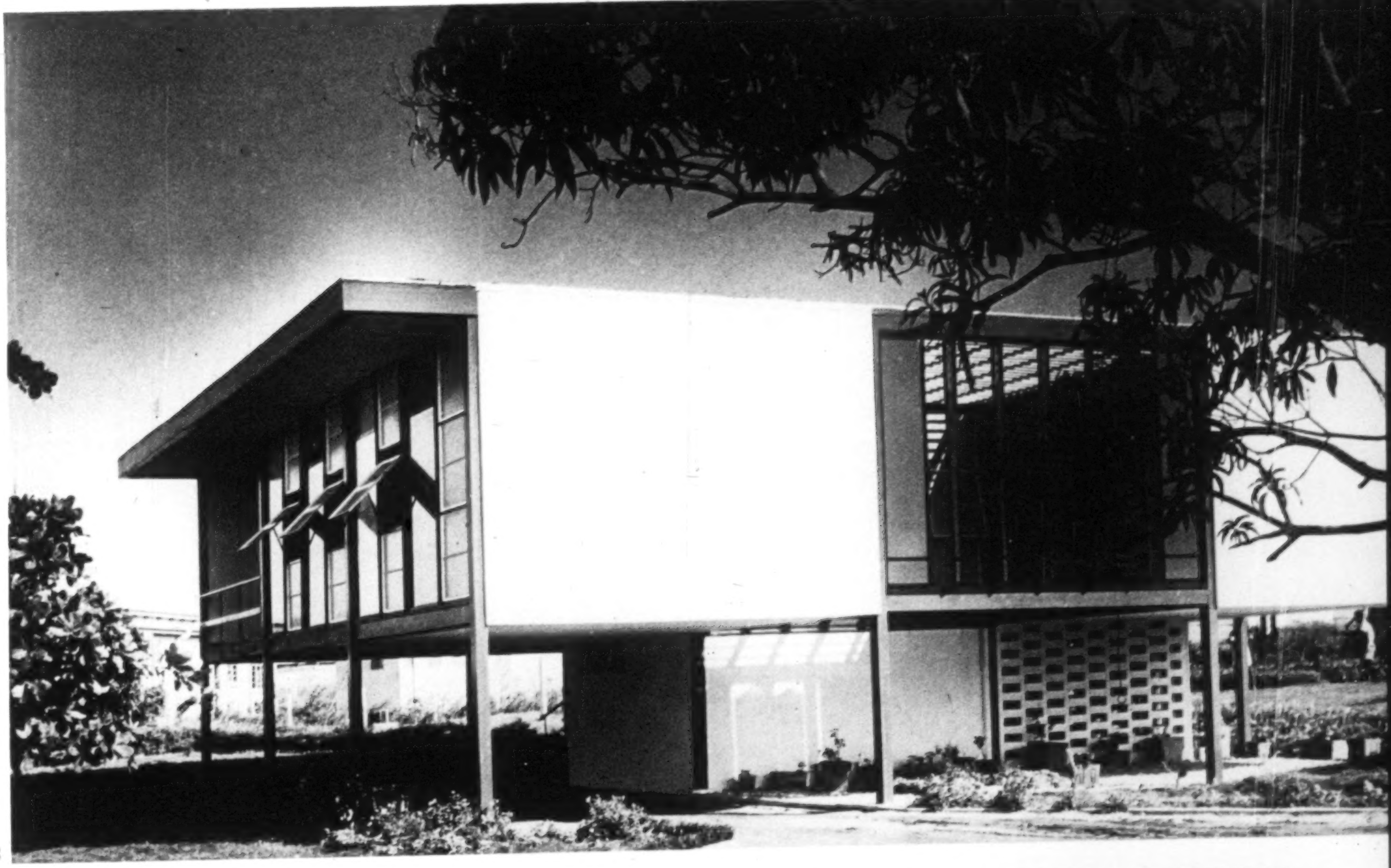
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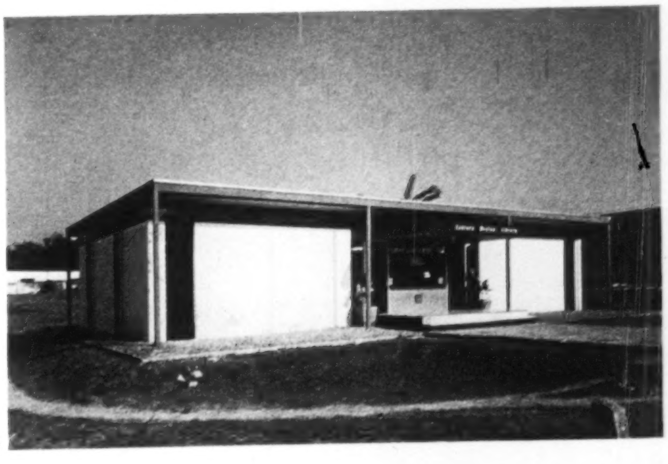
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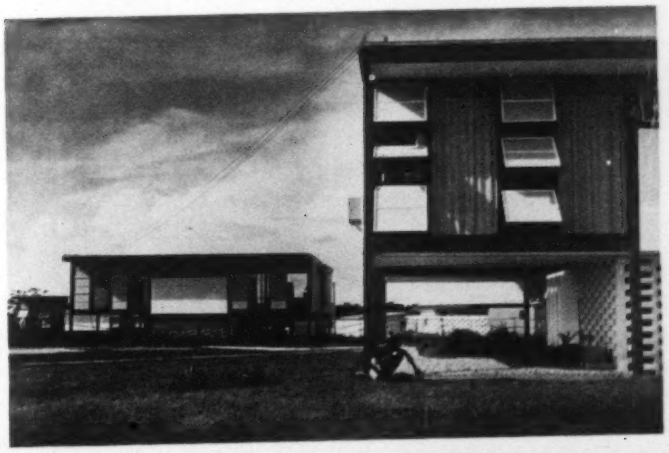

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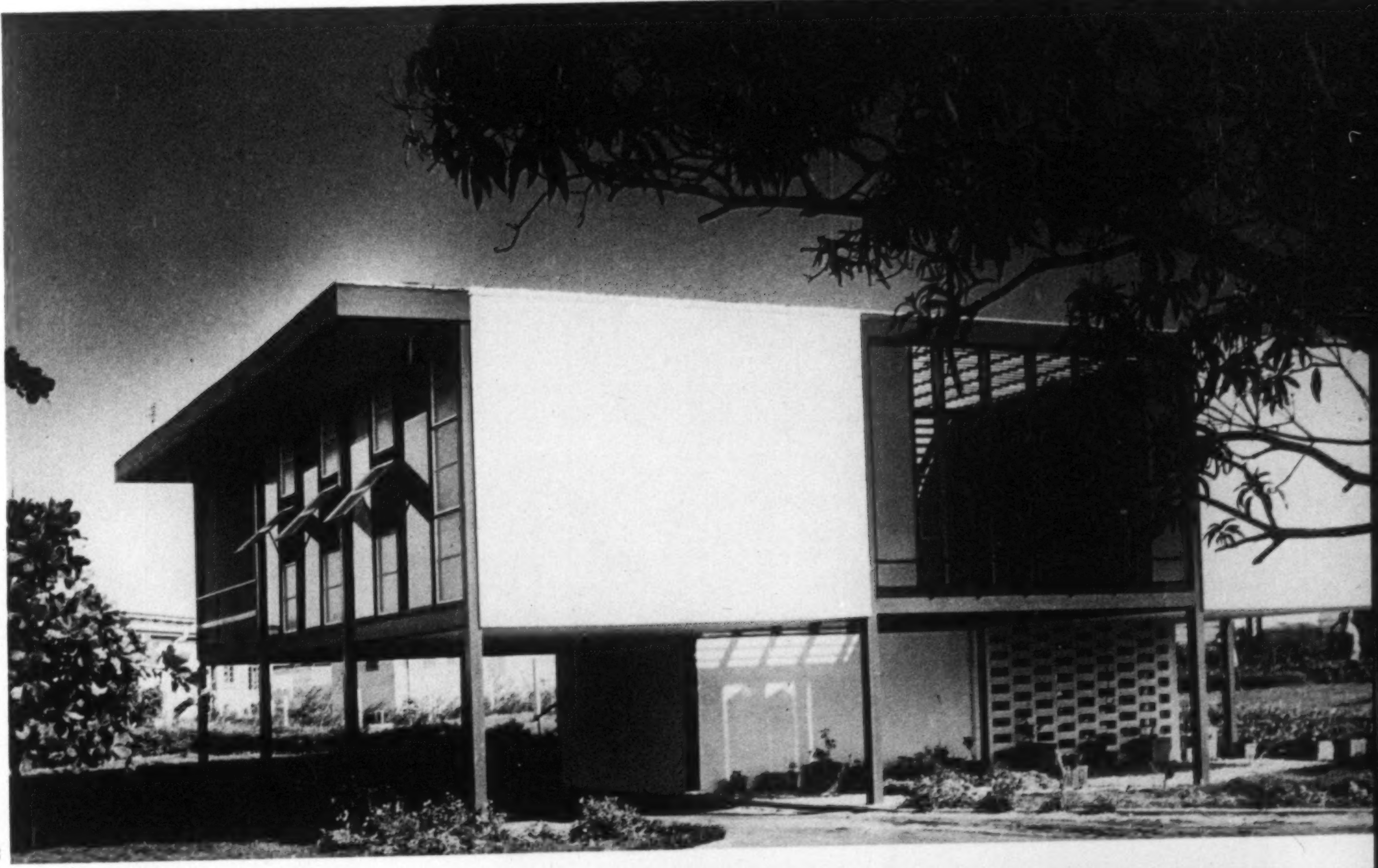

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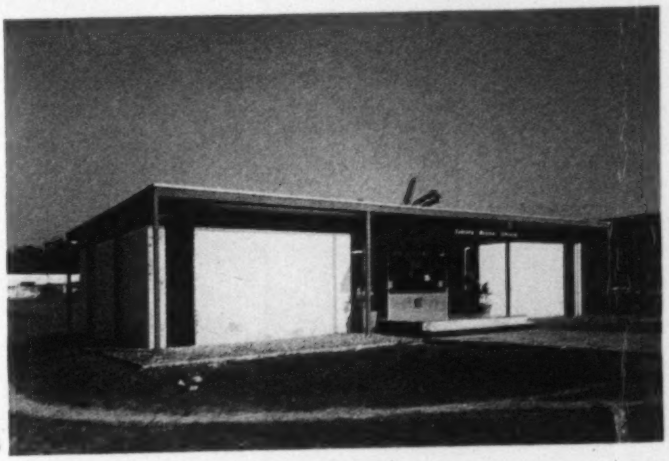

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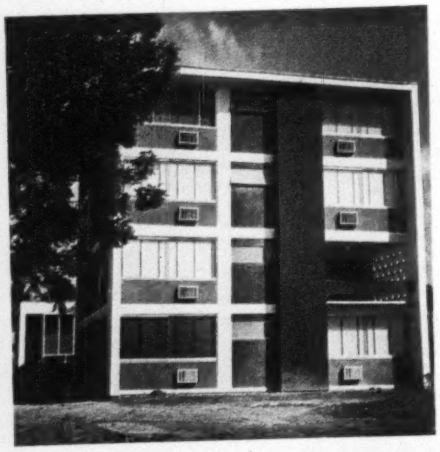
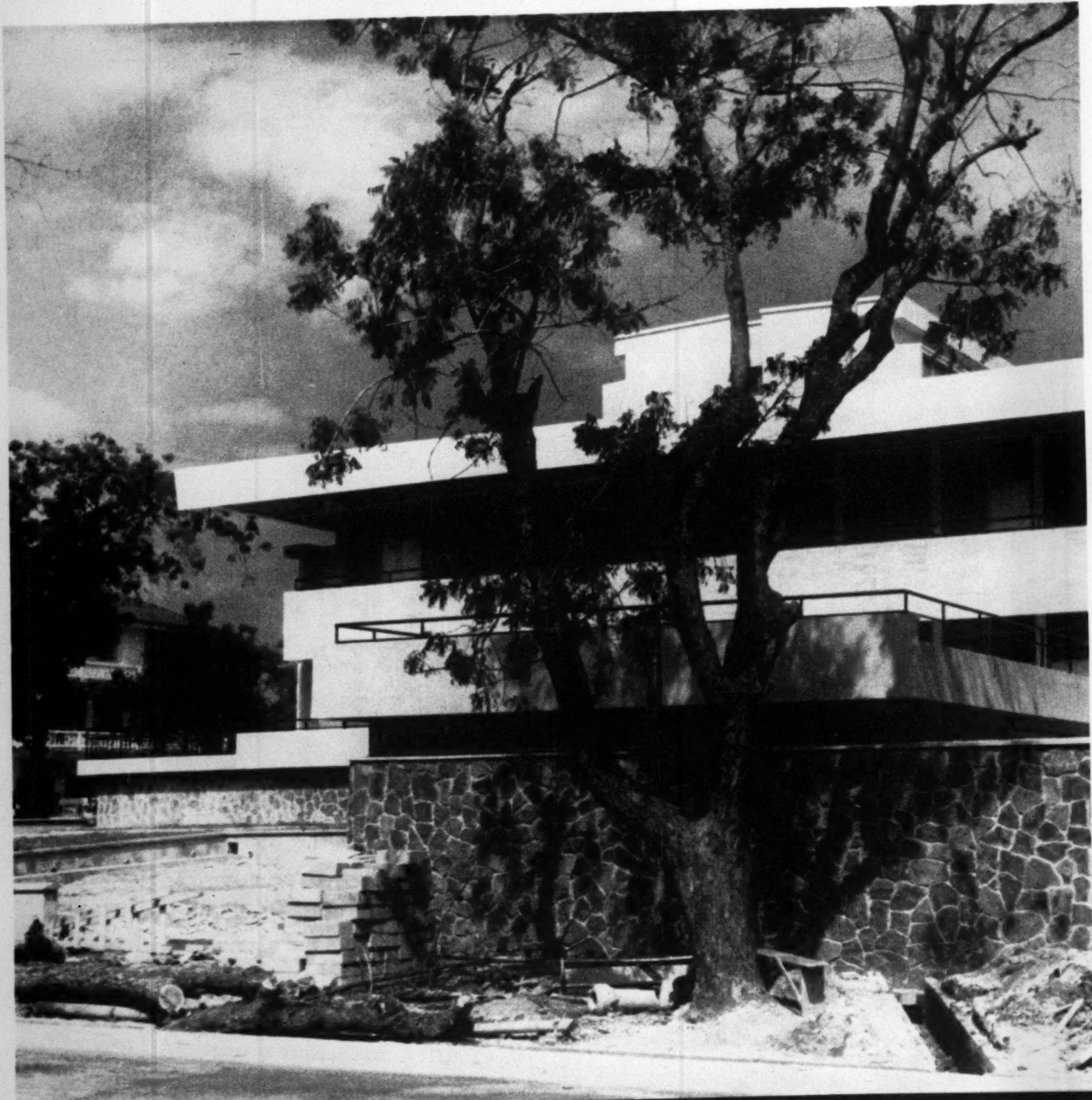
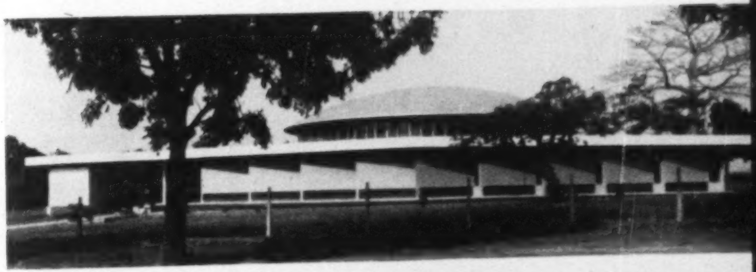

4

4, hotel at Accra (architects, Kenneth Scott Associates): extensions to the existing Avenida Hotel, consisting of four-storey bedroom block (shown in photograph), restaurant and bar. The bedroom block has fourteen air-conditioned rooms, each with a bathroom. The structure is reinforced concrete with external walls and partitions of concrete blocks, rendered. Roofs are timber with wood-wool decking and felt. Staircases are cast iron, helical type. Floors are terrazzo, and windows of aluminium, sliding horizontally, with Venetian blinds.





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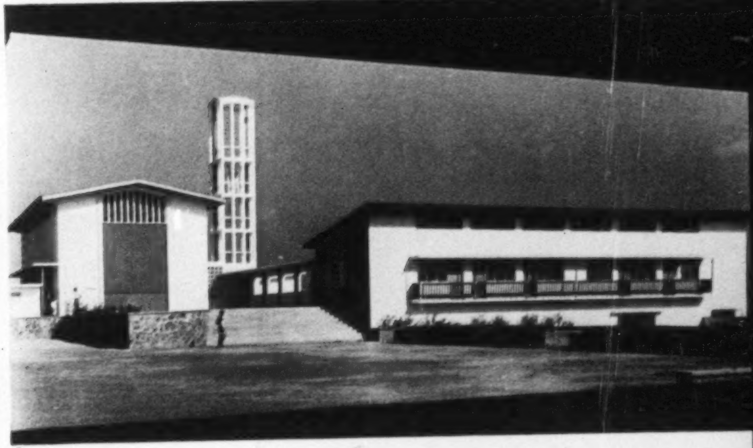

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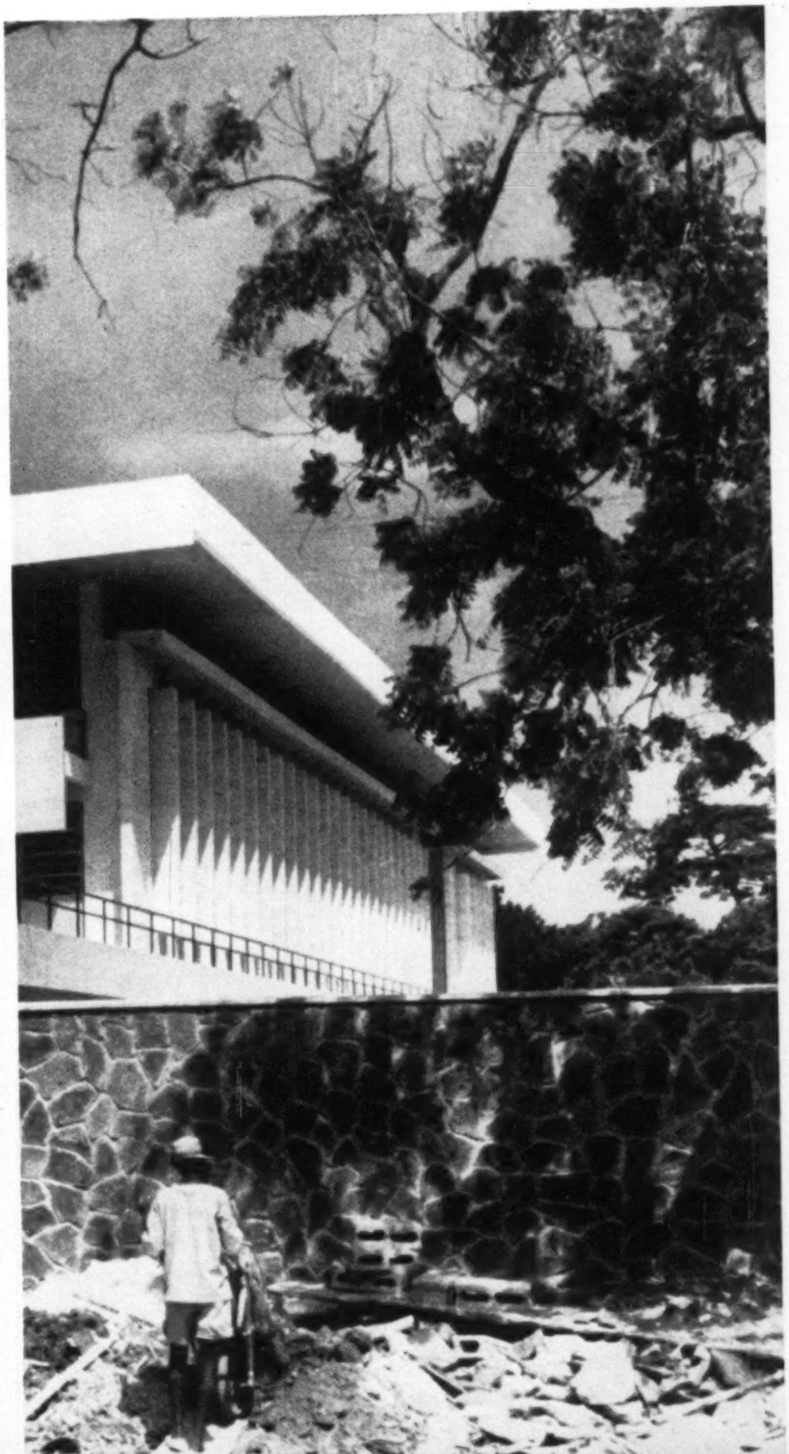
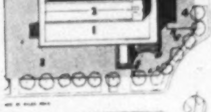


7

5, museum at Accra (architects, Drake and Lasdun), designed as the first stage of a national museum and opened in March, 1957, as part of the celebrations of Ghana's independence. The interior is lit by slit windows in the saw-tooth walls (shaded by the overhanging roof) and clerestory windows beneath the dome, also lighting a gallery. Construction is reinforced concrete and rendered brick, with aluminium dome prefabricated in Britain (see AR, June, 1957).

6, Boys' school at Apowa (architects, Fry, Drew and Partners), typical of the large number of schools and training colleges designed by these architects around 1950 for the then Gold Coast (see AR, May, 1953). The photograph shows the hall, chapel and administration building. Construction is reinforced concrete.

7, bank at Takoradi (architects, Drake and Lasdun). A large banking hall, shared by the Ghana Commercial Bank and the Bank of Ghana Currency Agency, is divided by light aluminium screens. Each user has a separate entrance, but they share strongrooms, staff-rooms, etc., which are at a lower level. A manager's flat is at roof level. Sun is excluded by the roof overhang and the projecting wall-fins. These, and the balcony, are faced with travertine. The base is faced with local stone. The main structure is concrete, the roof having a double skin for insulation. Windows are aluminium.



site plan, bank at Takoradi

key

1, banking hall.
2, manager's flat.
3, public car park.
4, manager's car park.
5, guards' quarters.
6, service yard.
7, warehouses and garages.
8, servants' quarters.

8

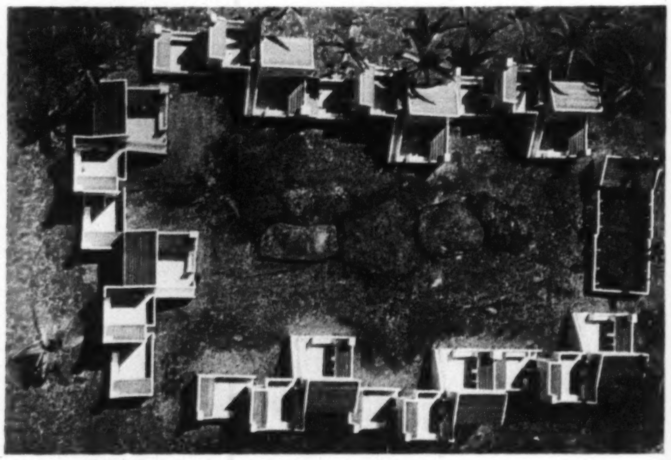
8, dormitory block, Mfantsipim School, Cape Coast (architect, Kenneth H. Holgate): one of a group of three buildings (the others still under construction) providing dormitory space for 200 students, together with common-rooms, etc., in this Methodist church school. Construction is reinforced concrete frame with concrete block infill, rendered with cement and sand. Panels under windows are additionally rendered in colour, a pattern being made by the use of a plywood template. Roofing is asbestos. Doors, windows and all exposed woodwork are oiled mahogany.

9

9, sports stadium at Kumasi (architects, Kenneth Scott Associates). Part of a sports arena containing fields, running and cycle tracks, open terraces for 24,000 spectators and an office and committee building. This grandstand, seating 1,500, has changing rooms, dormitories and stores beneath it. It is of reinforced concrete with balanced cantilever roof, left as it comes from the shuttering except that fascias and parapets are painted.

10

10, offices, showrooms, etc., for the motor department of the United Africa Company, Accra (architects, Kenneth Scott Associates). The main building has a showroom on the ground floor with mezzanine offices, and two office floors above. At right-angles is the storage building with new vehicles and spare-parts sales department on the ground floor and spare-parts storage above. There is a staff canteen on the roof.



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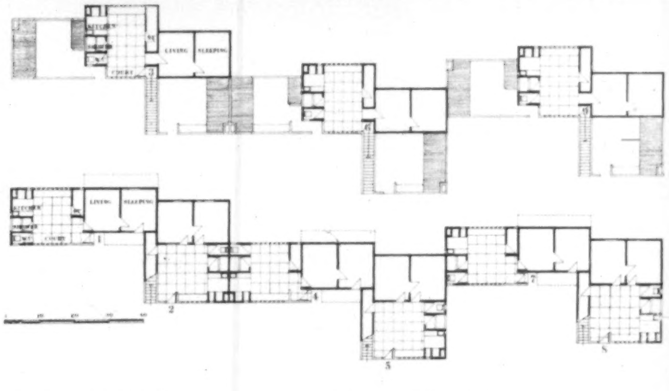
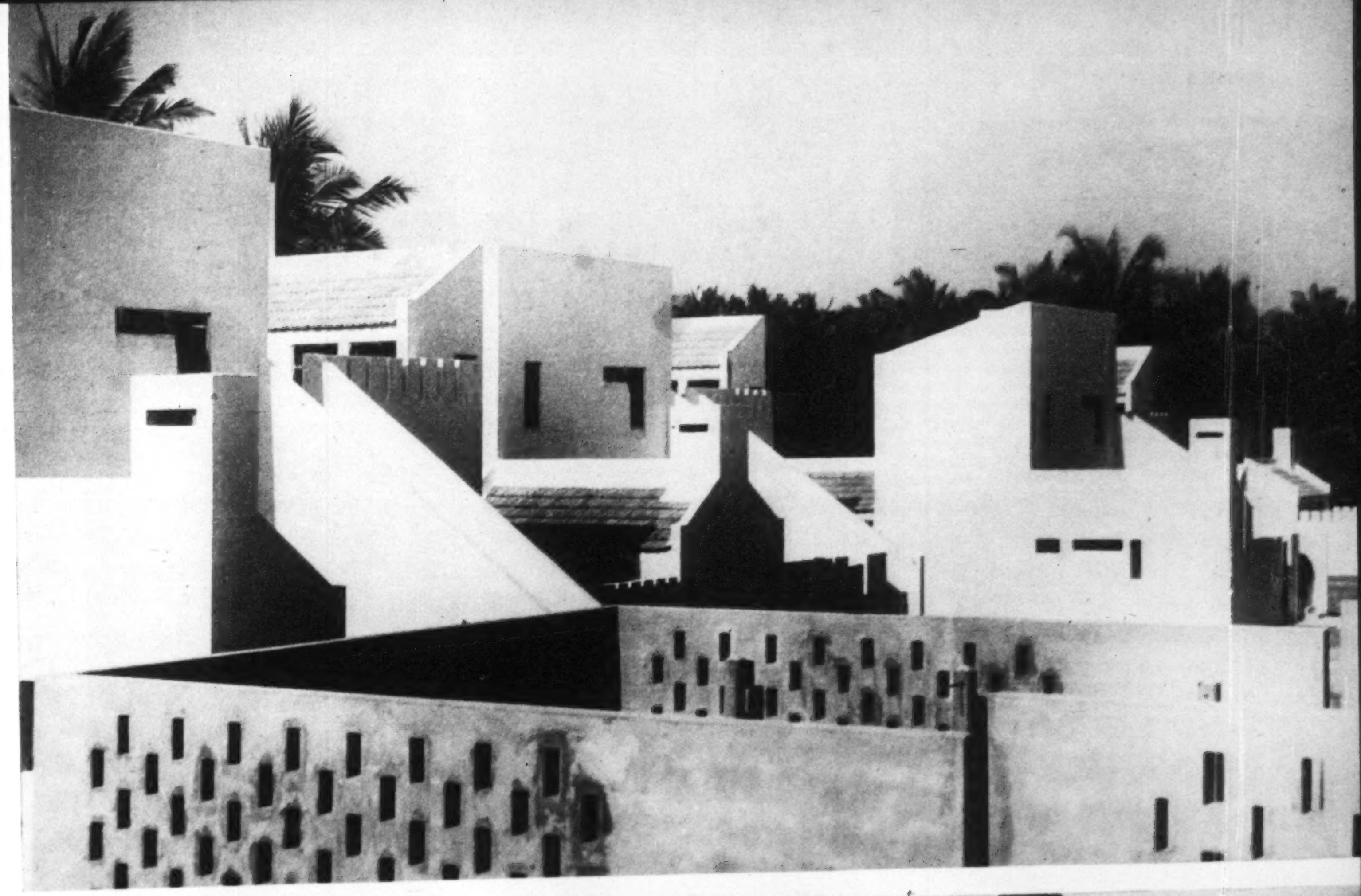


12→
13→

typical ground and first floor plans, junior staff quarters, Government House, Accra

11 (above) and 12 and 13 (facing page), junior staff quarters, Government House, Accra (architect, J. G. Halstead, chief architect, Public Works Department). Twenty-four self-contained dwellings occupy a one-and-a-half acre site adjoining the grounds of the seventeenth-century Danish castle which is now the official residence of the Prime Minister of Ghana. The architectural character of the castle is to some extent echoed in the style of the dwellings. These are planned in three blocks, surrounding the centre of the site where there were outcrops of rock. The fourth side of the square is occupied by a laundry and drying-yard. The dwellings look inwards to the square, which provides a safe playing space for children. Each block (see plan) consists of units of three dwellings—two ground-floor, one first-floor—which are only one room thick to provide cross-ventilation. Each dwelling has a private courtyard for open-air living and sleeping. Load-bearing walls are of rendered concrete blocks. Floors are reinforced concrete, roofs are timber, tiled, and windows and doors also timber.



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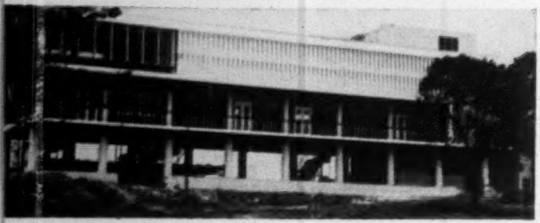
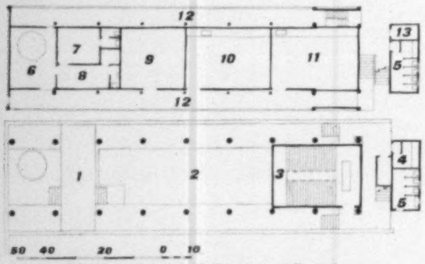
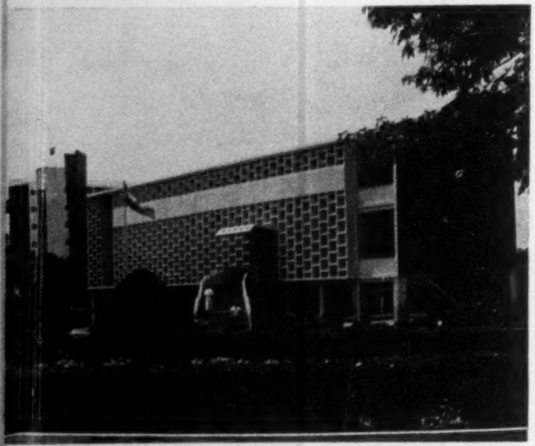

14

14, school of architecture at Kumasi (architect, Charles I. Hobbis): the first section of a two-phase programme for the School of Architecture, Town Planning and Building, at Kumasi College of Technology. There is a partly open ground floor (see plans below). On the second floor are three more studios and an exhibition hall; on the top floor one large classroom. The structure is reinforced concrete with walls of precast blocks or local stone and aluminium roof.

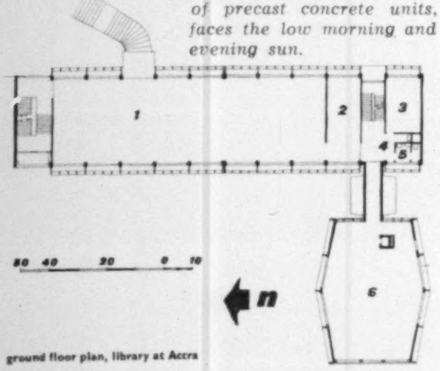


key
1, roadway.
2, garden.
3, lecture theatre.
4, dark room.
5, lavatories.
6, entrance hall.
7, headmaster.
8, secretary.
9, library.
10, studio.
11, materials gallery and store.
12, open balcony.
13, store.

ground and first floor plans, school of architecture, Kumasi

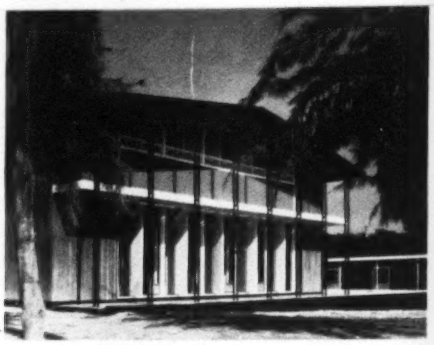

15

15, library at Accra (architects, Nickson and Borys): a three-storey building in the centre of Accra near the classical-style Supreme Court. The ground floor is partly open, with parking area and services; on the first floor (see plan below) is the lending library and on the second the reference library. Stackrooms are behind. The brise-soleil, of precast concrete units, faces the low morning and evening sun.

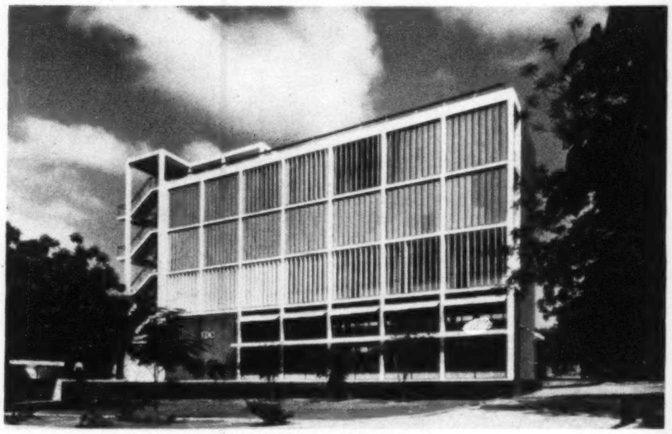


key
1, lending library.
2, stack room.
3, stores and binders.
4, staff hall.
5, lavatories.
6, cataloguing.

ground floor plan, library at Accra


16

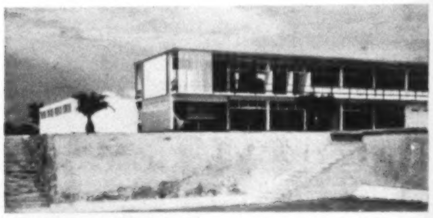
16, assembly hall, Accra (architects, James Cubitt and Partners), built as a memorial to Gold Coast personnel killed in the war. It contains hall, foyer, bar and offices and a small flat for the secretary. Construction is timber. (See AR, May, 1956.)


17

17, showrooms and offices at Accra for the Industrial Development Corporation (architects, James Cubitt and Partners): the south façade, with louvred walls to give shade.

18 (below), school at Sekondi (architects, James Cubitt and Partners): the science block (see AR, May, 1956).

19 and 20, Kumasi College of Technology (architects, James Cubitt and Partners), a large scheme already illustrated in the AR (May, 1956). 19, the pharmacy building; 20, the engineering workshops, with ventilated timber roofs hung from concrete Y-beams.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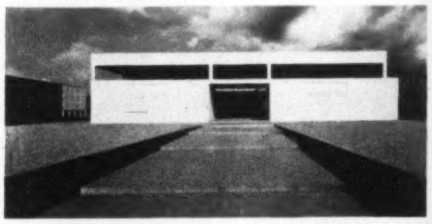
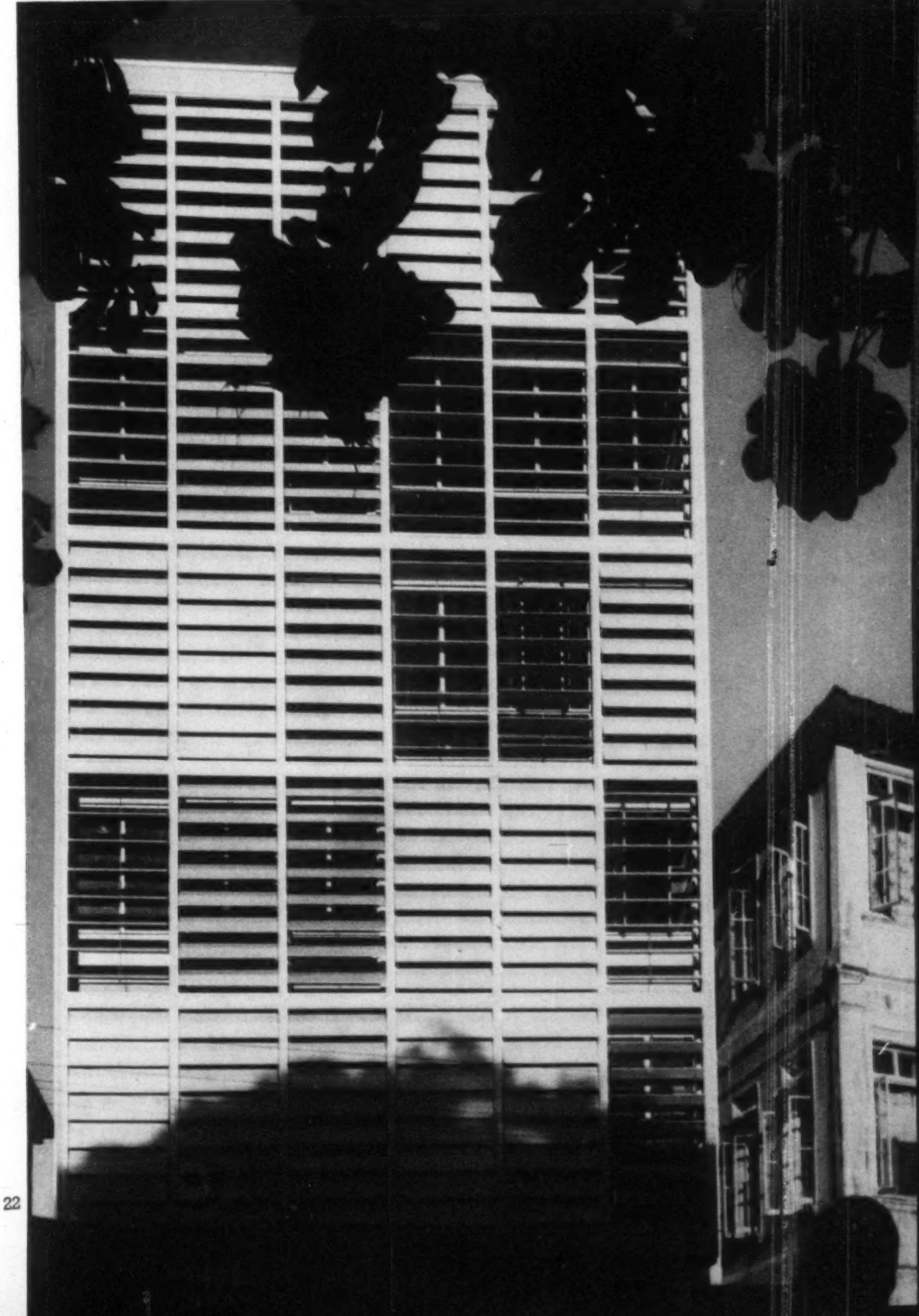

19

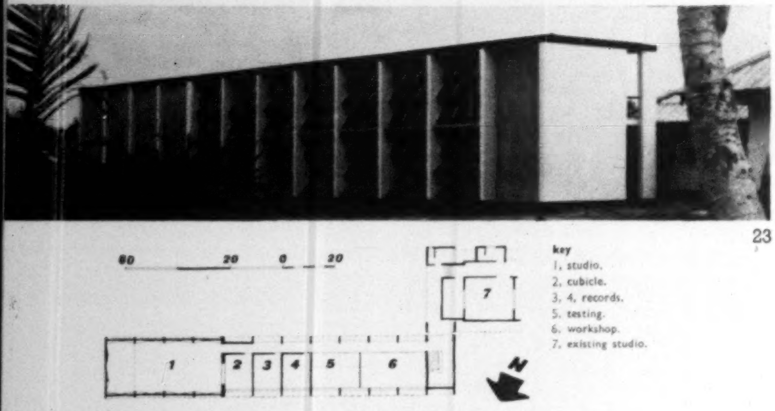
20

21

21 and 22, offices and showrooms in Lagos (architects, Godwin and Hopwood), the first stage of a two-stage project for Allen and Hanburys (Nigeria) Ltd., on the east side of Tinubu Square. Most of the ground floor is open for car-parking. Showrooms, reception and director's office are on the first floor and above are four more floors of offices. The two main elevations, 22 below, had to be protected from the low morning and evening sun and have adjustable aluminium louvres, with pivoted windows behind to admit the breeze. Construction is reinforced concrete. The concrete slab roof has an aluminium roof over it, with air-space between.

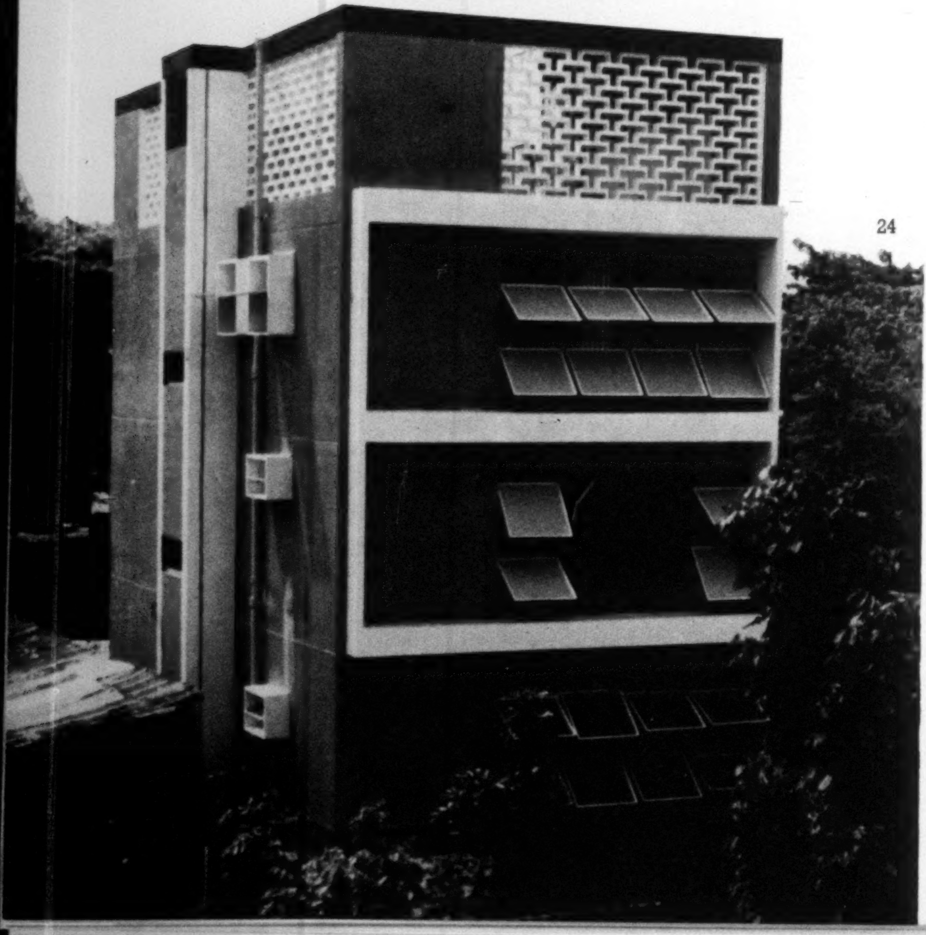

22

NIGERIA

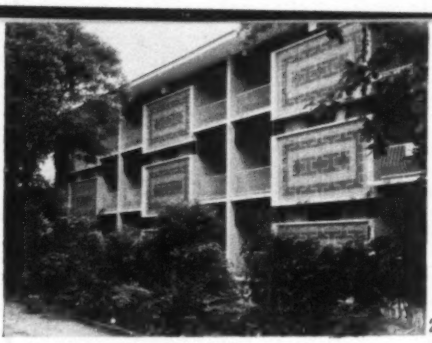


23

23, extensions to Broadcasting House, Enugu (architects, Godwin and Hopwood). It contains a two-storey studio with technical rooms alongside it (see plan), above which are offices. The main windows face south. The studio is separated from the remainder by an expansion joint. Construction is load-bearing piers of hollow blocks, filled with concrete, and reinforced concrete floor and roof beams. Roof covering is aluminium and the walls are insulated with aluminium foil. The interior is air-conditioned from a plant in a semi-basement beneath the studio.

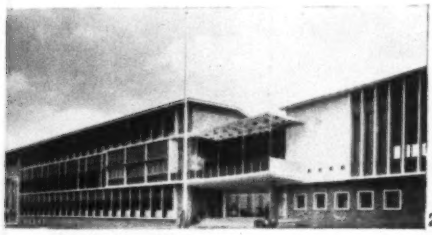


24



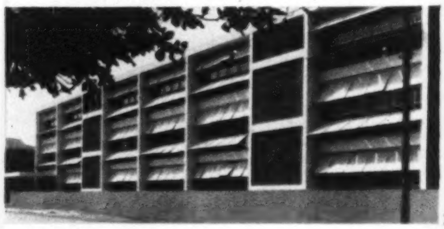
25

25, bedroom block, Ikoyi hotel, Lagos (architects, Halliday and Webster—Design Group Nigeria): a detached block in the grounds of the existing hotel, providing 24 single and 12 double bedrooms each with its own bathroom and private balcony, reached from a central corridor. All rooms are air-conditioned. Construction is reinforced concrete with projecting panels (forming the wall of the bathrooms, which have clerestory lighting) faced with ceramic mosaic tiles.



26

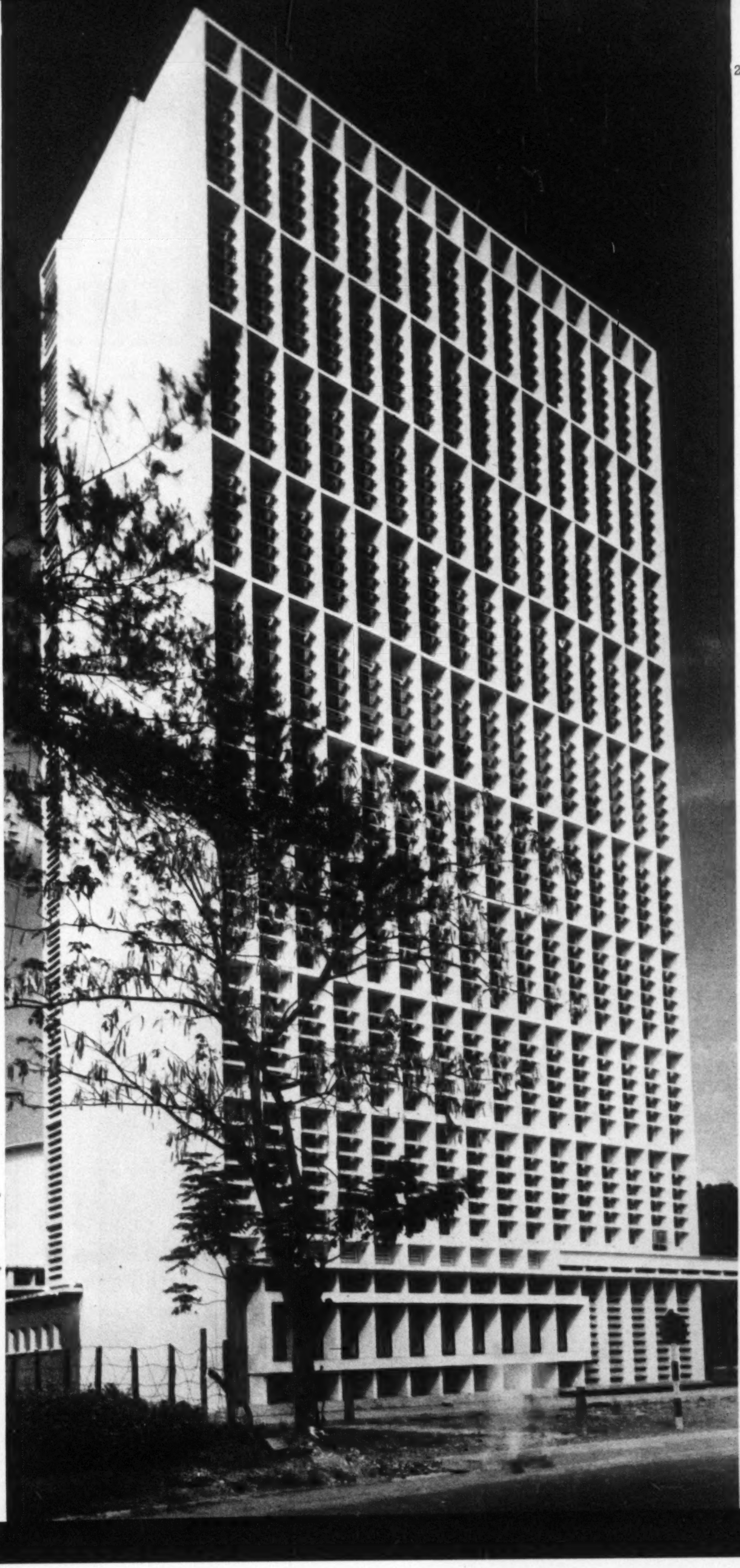
26, Treasury Buildings, Ibadan (architect, J. E. K. Harrison, in association with the Ministry of Works and Transport, Nigeria Western Region): the principal government office building for the Region; providing offices for the Prime Minister and his staff, a cabinet room and offices for the Ministry of Finance. The photograph is from the south-east, showing the large balcony outside the Prime Minister's room.



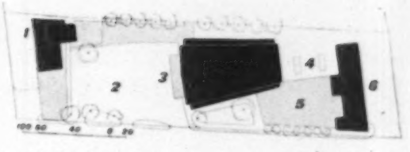
27

27, school at Lagos (architects, Godwin and Hopwood), a Methodist school for 1,080 boys and girls, comprising two classroom wings with a covered assembly space between. The photograph shows the longer block, facing south, at the far end of which is a maisonette for one of the Methodist catechists. Construction is reinforced concrete with brick infill and timber and aluminium roofs.

24 (left), architect's own office and residence, Lagos (architects, Godwin and Hopwood). On a restricted site on Lagos Island, it has four floors each divided in two and linked by a spiral stair. The two lower floors contain car-port, entrance and offices and the two upper floors a maisonette with roof-garden above. Servants' quarters are in a separate building behind. Windows are kept to a minimum on the east-west walls (the photograph shows the building from the north) except on the bedroom floor which is air-conditioned. Construction is reinforced concrete and hollow blocks.

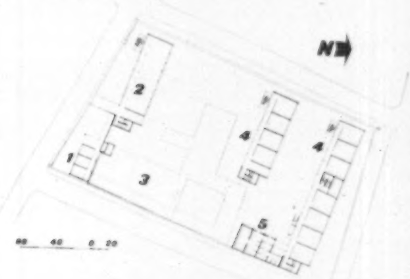


28

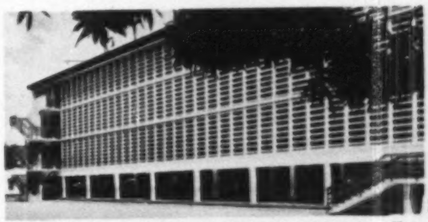


key. 1, bank and tower. 2, car parking. 3, assembly hall. 4, service yard. 5, roof restaurant and showroom. 6, shop.

28 (left), *office building, Ibadan (architects, Fry, Drew, Drake and Lasdun), for the Co-operative Bank of Western Nigeria. The 10-storey tower shown in the photograph has the bank on the ground and first floors. Also on the site (see plan above) are an assembly hall seating 850 for co-operative and other functions, a shop wing with offices over and a showroom with restaurant on roof. Construction is reinforced concrete.*

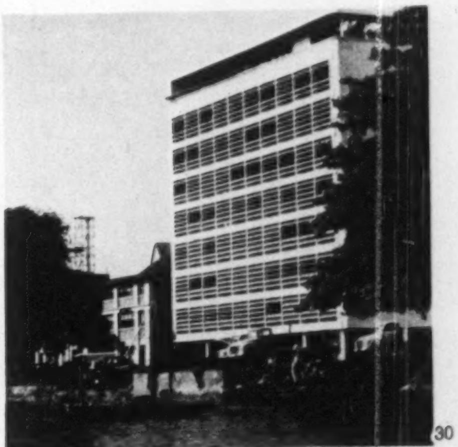


key. 1, admin. building. 2, assembly hall and meal room. 3, existing school (to be demolished). 4, classroom blocks. 5, lavatory block



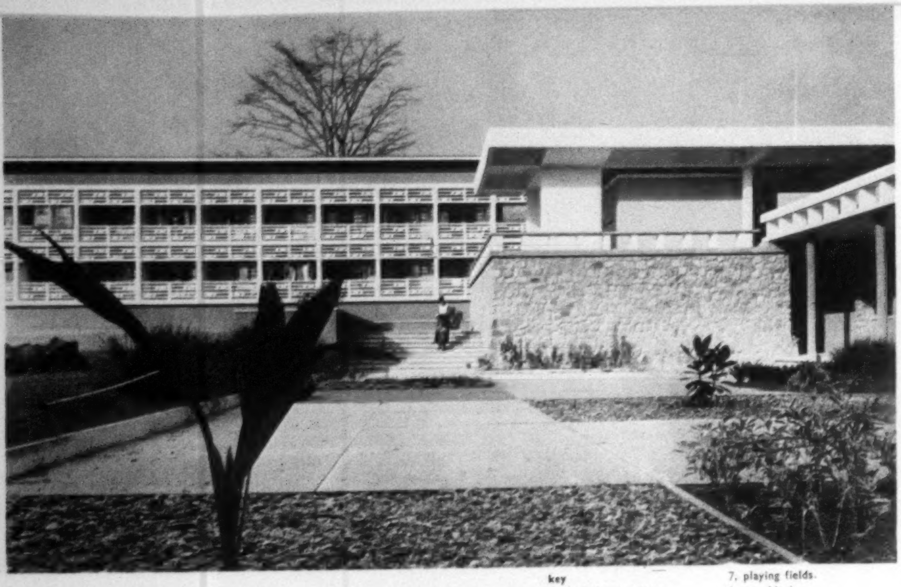
29

29, *primary school, Lagos (architects, Fry, Drew, Drake and Lasdun): one of a series using multiples of four and eight classrooms in units adaptable to various sites. Construction is reinforced concrete, with concrete block walls including precast louvre blocks. Windows have timber frames. Site plan above.*



30

30, *office building on the waterfront at Lagos, for the same clients as 28 (architects, Fry, Drew and Partners). The ground floor is open, for use as car-parking. Construction is reinforced concrete frame, with the blank side wall faced in travertine. The windows are protected by adjustable aluminium louvres.*



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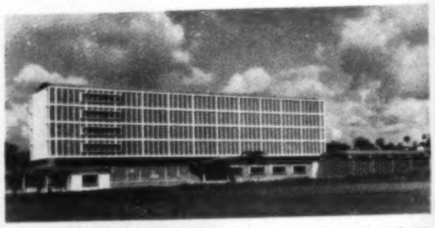
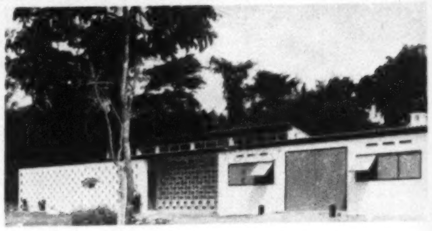
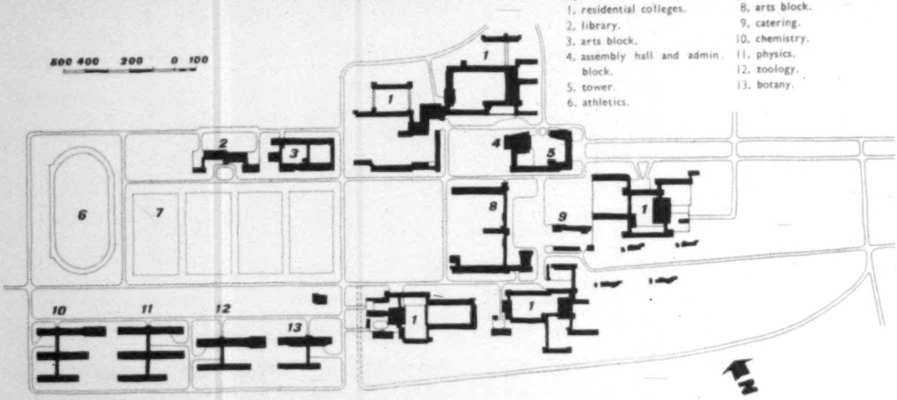


32



33


key
1, residential colleges.
2, library.
3, arts block.
4, assembly hall and admin. block.
5, tower.
6, athletics.
7, playing fields.
8, arts block.
9, catering.
10, chemistry.
11, physics.
12, zoology.
13, botany.
800 400 200 0 100
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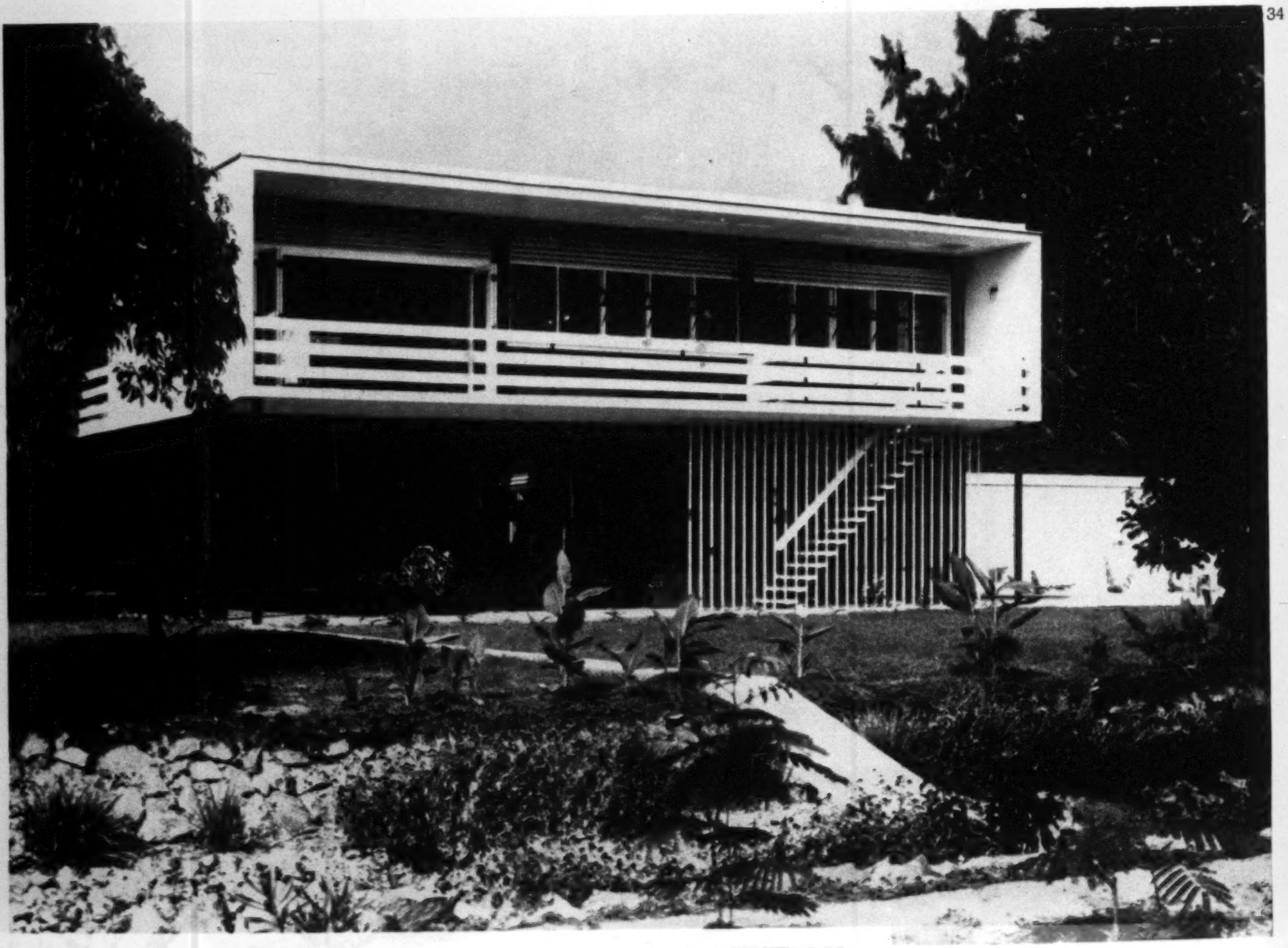
N

University College, Ibadan (architects, Fry, Drew and Partners): a complete university (see site plan, left) on a site of five square miles. 31, *one of the women's residential colleges (all of which are planned round courtyards).* 32, *the library, with natural cross-ventilation. It is fly-proofed behind perforated concrete screening.* 33, *housing for senior staff.*

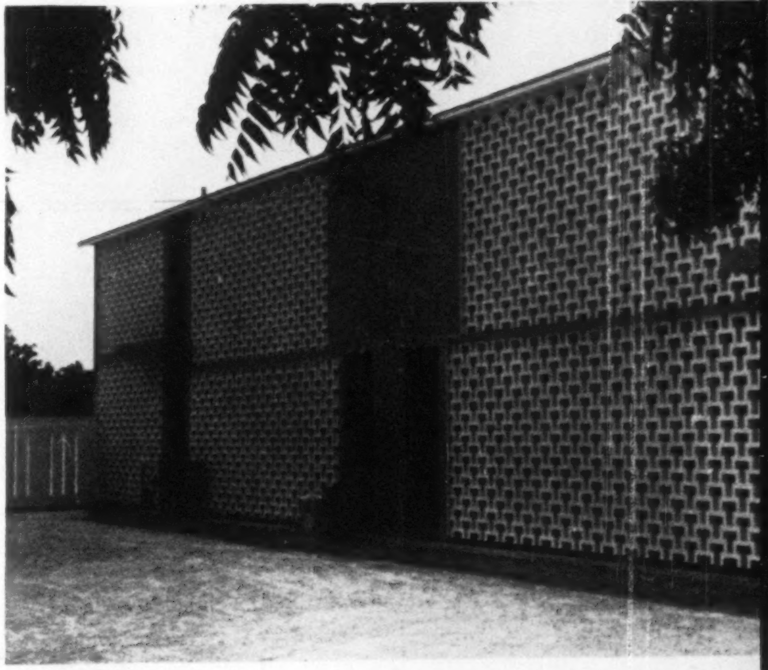
34 *(below), house at Ikoyi, Lagos (architects, Fry, Drew and Partners): one of three built for British Overseas Airways personnel. On the ground floor is a garage and a guest suite. Above is a two-bedroom flat with a terrace (shown in the photograph) opening from the living room. There is also a 20ft. square central open court. Construction is reinforced concrete with block walls and hardwood windows.*



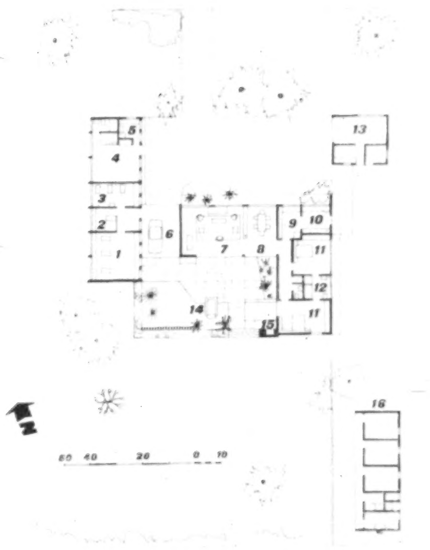
34

NIGERIA

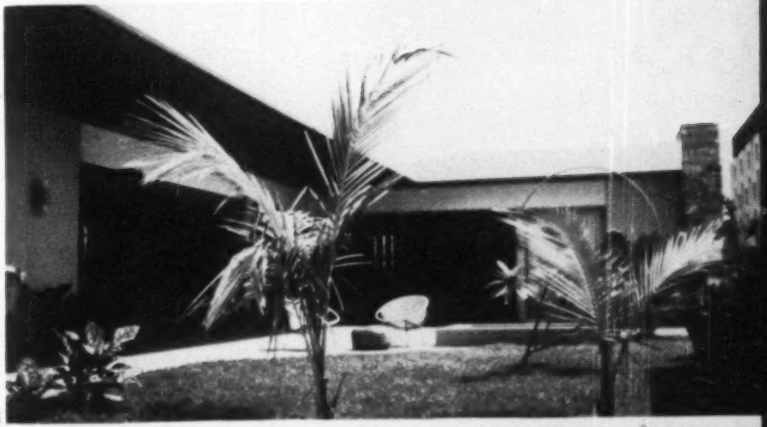
35, houses at Kano (architects, James Cubitt and Partners) for Barclay's Bank. A group of semi-detached houses to which two more pairs will later be added. The near-desert climate of Kano demands protection against heat and glare, provided by a perforated screen of concrete blocks 3ft. in front of the south wall and a wide roof overhang on the north wall. Construction is of concrete beams and blocks with timber and asbestos roof.

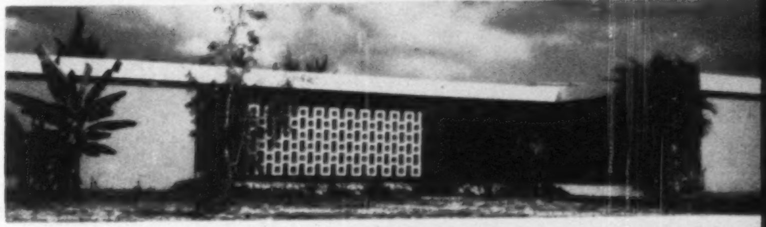

35

key
1. architects' office.
2. secretary.
3. draughtsmen.
4. guest room.
5. guest's kitchen.
6. car park.
7. living room.
8. dining room.
9. pantry.
10. kitchen.
11. bedrooms.
12. bath.
13. garage.
14. shower basin.
15. barbecue.
16. servants' quarters.

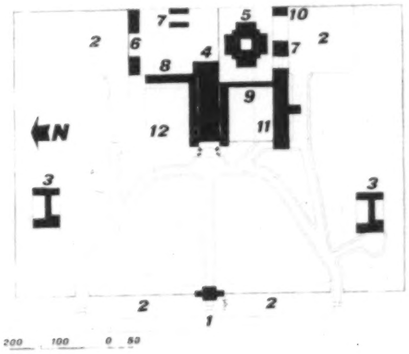


36 and 37, architects' own house and office at Apapa, Lagos (architects, Becker and Voigt): single-storey, with garage and boys' quarters separate. The house itself, and the office and guest wing, both facing a screened courtyard, 36, are separated by a car-port (see plan above). 37, view from the south-west. Walls are load-bearing blocks; the roof is reinforced concrete and timber.

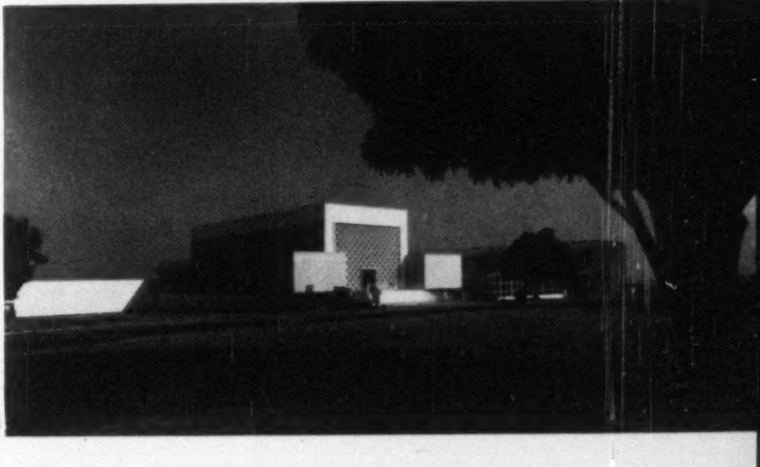

36


37

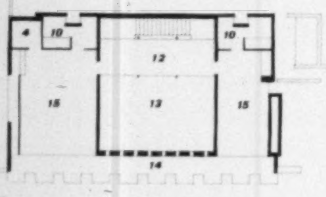
key
1. main entrance.
2. car parks.
3. private secretaries' lodges.
4. reception.
5. wives' quarters.
6. garages.
7. kitchens.
8. servants' quarters.
9. covered way.
10. caretaker.
11. domestic block.
12. future extension.



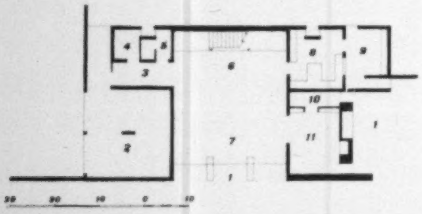
38, State House, Kaduna, Northern Region (Ministry of Works, Northern Region: chief architect, J. E. Evans; architect, J. R. Greer-Perry): a symmetrical group of buildings (site-plan above) with a high reception hall in the centre flanked by a cabinet room on one side (not yet built) and the Prime Minister's offices on the other. All are linked by covered ways. Ancillary buildings enclose garden courts. Construction is reinforced concrete and concrete blocks with a steel roof to the hall.


38

NIGERIA



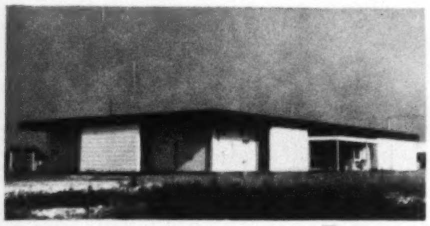
first floor plan



ground floor plan of house at Kano

key. 1, terraces. 2, garage. 3, lobby. 4, stores. 5, lavatories. 6, dining area. 7, living area. 8, kitchen. 9, laundry yard. 10, bathrooms. 11, study. 12, bridge. 13, upper part of living room. 14, balcony. 15, bedrooms.

41



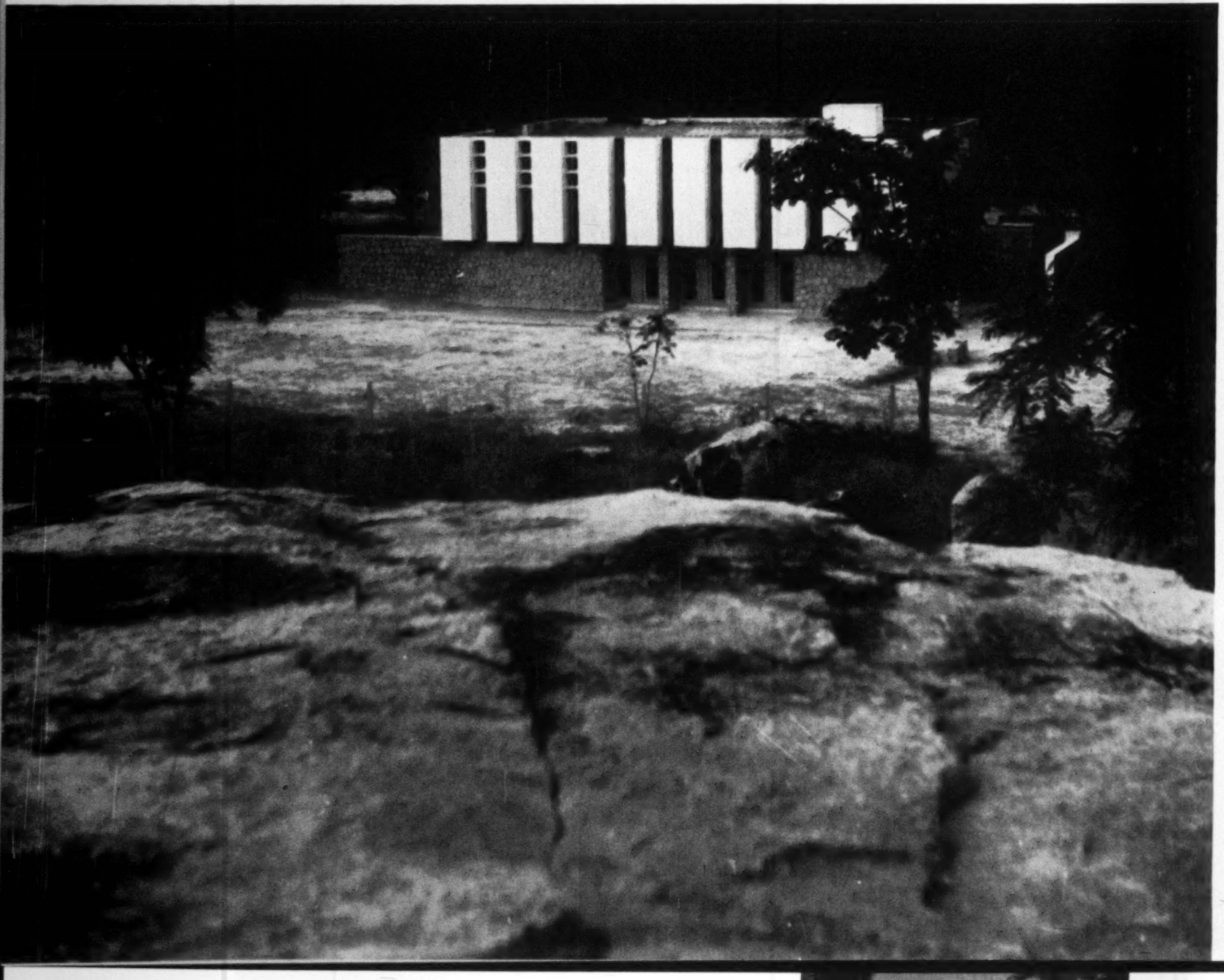
39

39, house at Lagos (architects, the Architects' Co-Partnership) for the general manager of an oil company. It is planned to provide natural ventilation to the living-rooms; the bedroom wing is air-conditioned. Concrete block walls support timber roof beams and aluminium sheeting.

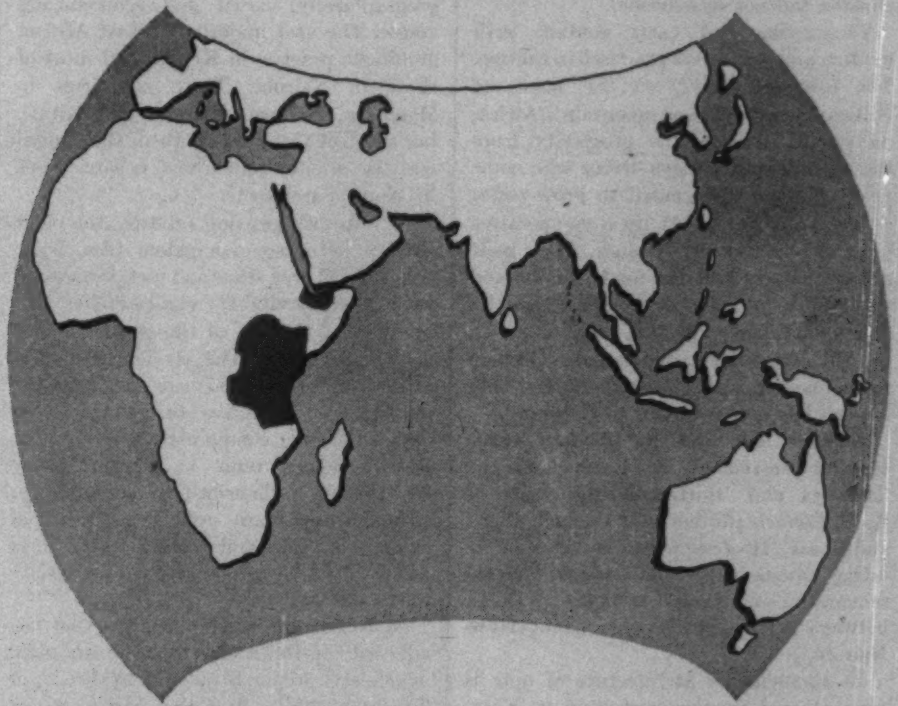
41, house at Kano (architects, the Architects' Co-Partnership), designed for the hot dry climate of this region. The ground floor walls are of rubble stone 18in. thick and have small openings, providing protection from high daytime temperatures. The heat from these walls, however, radiates after sundown into the interior of the house, so a light structure has been used on the first floor, composed of steel rods and aluminium sheetings, the high conductivity of which quickly disperses at sundown the heat absorbed during the day. Plan on left.

40

40, dock offices at Port Harcourt (architects, the Architects' Co-Partnership) for the Nigerian Ports Authority. The first floor windows are shaded on the corridor side by adjustable vertical louvres allowing full ventilation and on the office side by horizontal aluminium louvres hung from the roof beam.



Richard Hughes



EAST AFRICA

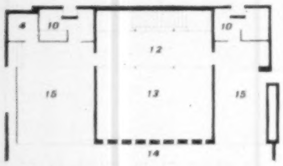
East Africa as a region consists of four territories, distinct from one another in historical and political development, climatic and geographic characteristics and economic levels. These factors affect their architectural character no less than do the differences in procedure for the registration of architects.

Zanzibar, the smallest and most isolated of the units in the region, is still in the grip of a strong Arabic influence. The island is ruled by a hereditary Sultan, part of a tradition which includes the architecture, with arcaded courtyards and white walls, embellished with complex tracery, purple shadowed in the strong sun. The narrow streets, overhung with intricately carved balconies, and lined with blank walls punctuated by carved doors, massive and black with age, apparently create too strong an atmosphere for modern architecture—banks, petrol stations and even the airport are built with moorish arches and traceried balconies. One should add that lack of space in the town of Zanzibar makes new buildings of any style comparatively rare.

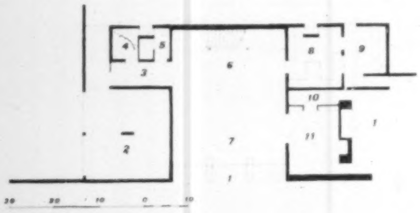
Tanganyika, the largest in area and population of the East African territories, is in many ways the most interesting. Politically Tanganyika, under the leadership of Julius Nyerere, is closer to responsible self-government than either Kenya or Uganda, and with less bitterness and controversy between the various racial groups. The legacy of German colonial architecture, with improbably slender cast-iron columns supporting wide first-floor verandahs and white-painted louvred shutters with black trim, is a valuable one to the coastal towns of Tanganyika.

Since the war, new buildings in Dar es Salaam, as in Mombasa farther to the north, have mostly been covered with concrete louvres or egg-crate brise soleil, in an attempt to keep out direct rays of the sun. The general economic level of the country does not allow many entirely air-conditioned buildings, which could be designed as such, or more sophisticated adjustable types of sun-screening which would provide better conditions and more interesting and intricate elevational patterns. The result is a certain heaviness and crudity. An allied factor is that standards of workmanship are such that buildings must be designed down to the level of the craftsmen available. Other than simple screening of the sun's rays, there has been little exploration of climatic design. The hot and humid conditions to be found along the coast affect Mombasa, Tanga and Dar es Salaam. A characteristic of this climate is little diurnal and annual range: the mean maximum and minimum temperatures for Mombasa are 86 deg. and 72 deg., with a mean humidity of 80 per cent. Towns such as Kisumu,

NIGERIA



first floor plan



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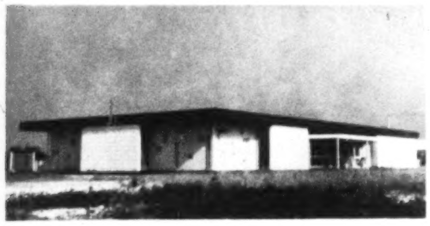

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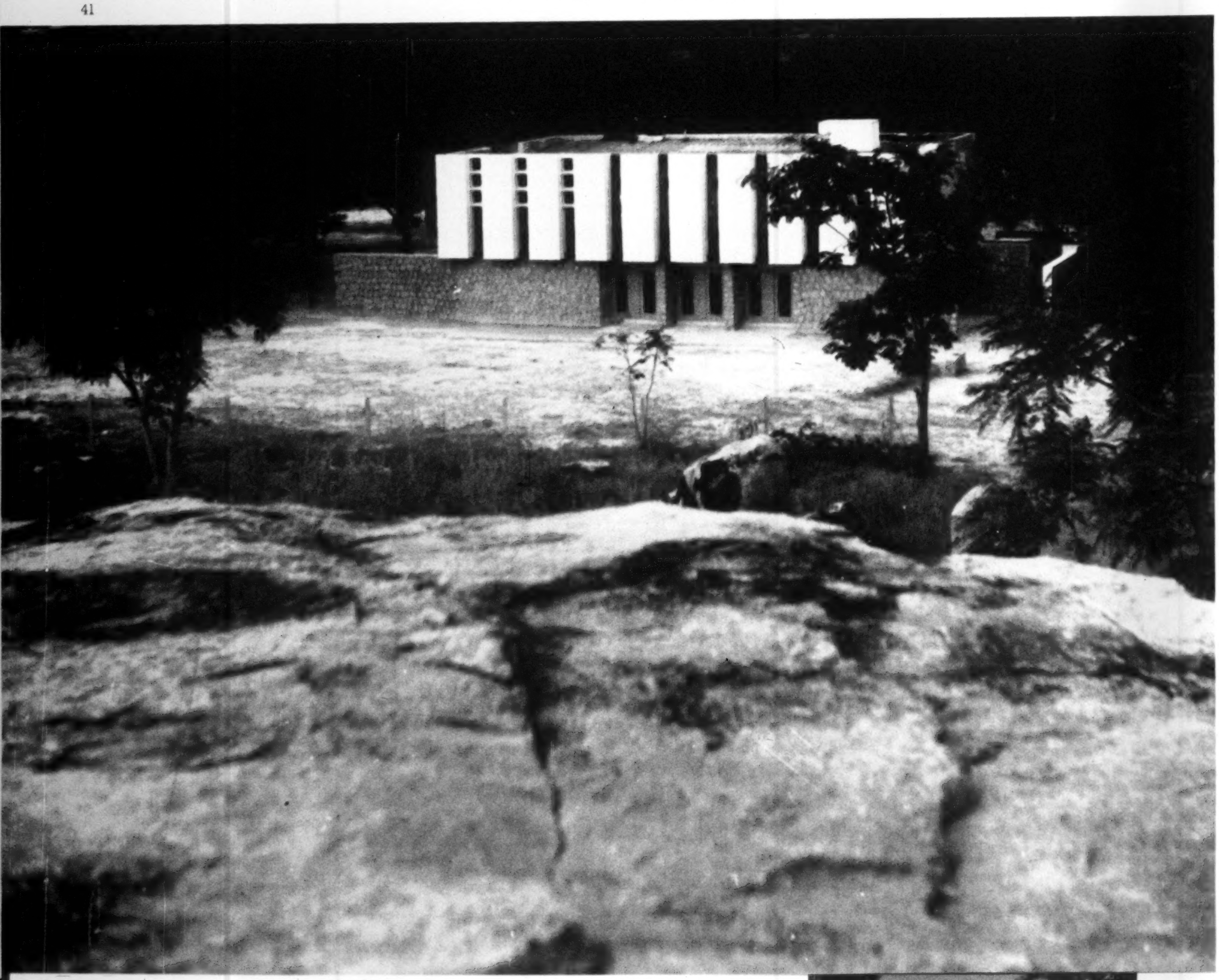
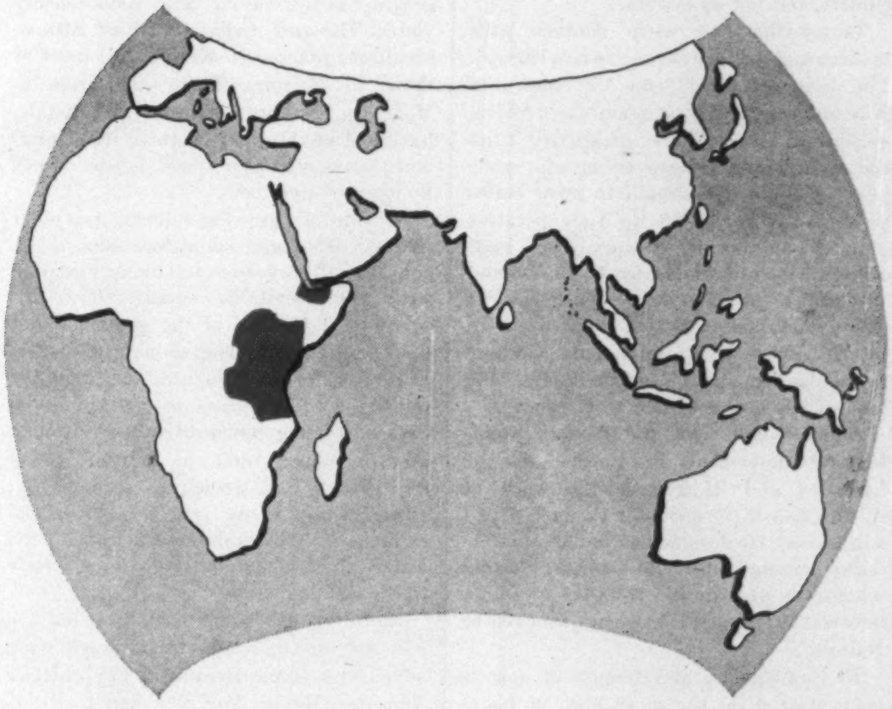


Richard Hughes



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Since the war, new buildings in Dar es Salaam, as in Mombasa farther to the north, have mostly been covered with concrete louvres or egg-crate brise soleil, in an attempt to keep out direct rays of the sun. The general economic level of the country does not allow many entirely air-conditioned buildings, which could be designed as such, or more sophisticated adjustable types of sun-screening which would provide better conditions and more interesting and intricate elevational patterns. The result is a certain heaviness and crudity. An allied factor is that standards of workmanship are such that buildings must be designed down to the level of the craftsmen available. Other than simple screening of the sun's rays, there has been little exploration of climatic design. The hot and humid conditions to be found along the coast affect Mombasa, Tanga and Dar es Salaam. A characteristic of this climate is little diurnal and annual range: the mean maximum and minimum temperatures for Mombasa are 86 deg. and 72 deg., with a mean humidity of 80 per cent. Towns such as Kisumu, Entebbe and Kampala, on the shores of Lake Victoria, also have a hot and humid climate, but not so extreme.

Tanganyika had early contact with modern architecture as practised in Europe. The town of Moshi, on the slopes of Kilimanjaro, the highest mountain in Africa, derives its considerable prosperity from the enterprising Chagga tribe, who some years ago were persuaded to grow coffee as a cash crop and set up a co-operative union to market the produce. They built a headquarters building for the union and a number of clinics, schools, district offices and houses, which were designed by Dr. Ernst May, the famous German town planner, and his partners. Dr. May himself has now returned to Germany.

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This has had a marked effect on the visual environment of East African towns, as more than half the non-government work is designed by other than qualified architects. The effect is, for the most part, crude and garish, with bizarre colouring and outmoded clichés, and the planning is often wasteful and inconvenient.

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In Nairobi's growing suburbs, the older pattern of orange mangalore tiles, 9 in. coursed dull grey stone and metal windows, with the inevitable small replica for servants at the end of the garden, is not now so frequent. The stridently modernistic work of the 'designers' has made the public more receptive to good modern design as being comparatively mild. Most private houses built in Nairobi today could loosely be described as contemporary, although too many reflect a superficial culling of the architectural magazines rather than a genuine style appropriate to the country.

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Local materials are limited: asbestos, concrete tiles and shingles are available locally, as is stone, some brick and hollow blocks, both clay and concrete. Portland cement and standard metal doors and windows are produced by East African factories. Practically all other materials and equipment, apart from timber (but including hardboard, softboard, plywood, etc.), have to be imported, mainly from Europe. This keeps building costs up and causes endless delays and frustration when local agents are out of stock of special fittings and materials.

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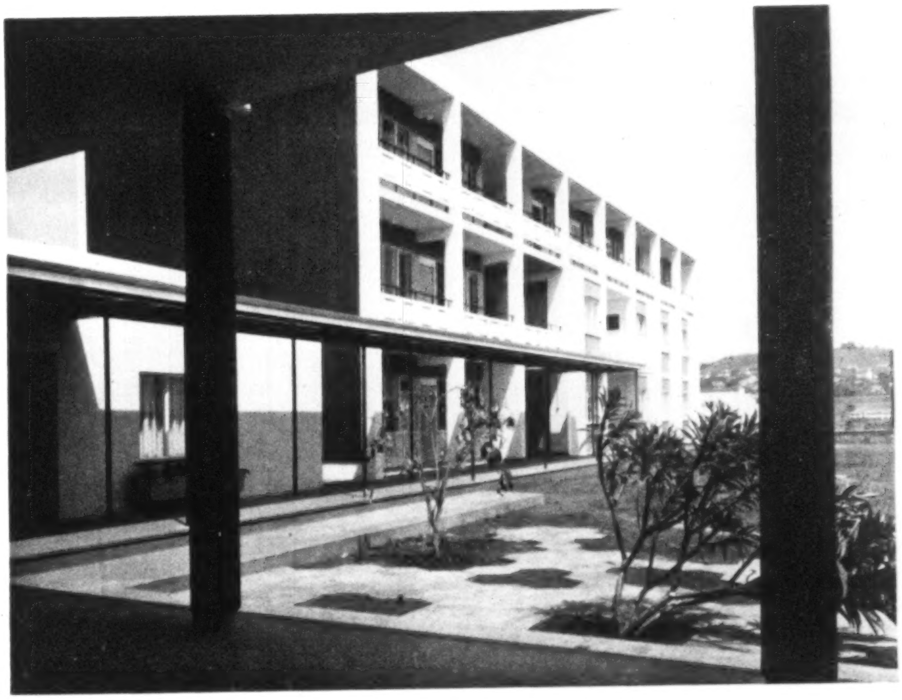
UGANDA



1

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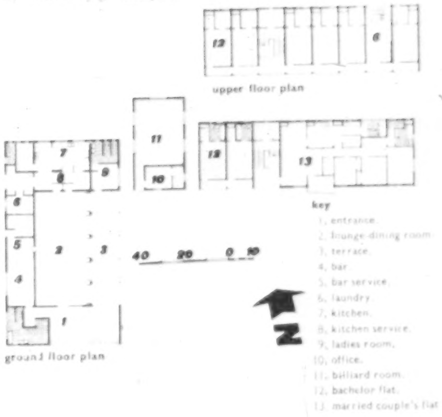
12
6
upper floor plan
11
10
12
13
7
8
9
6
5
2
3
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1
40
20
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10
N
ground floor plan
key
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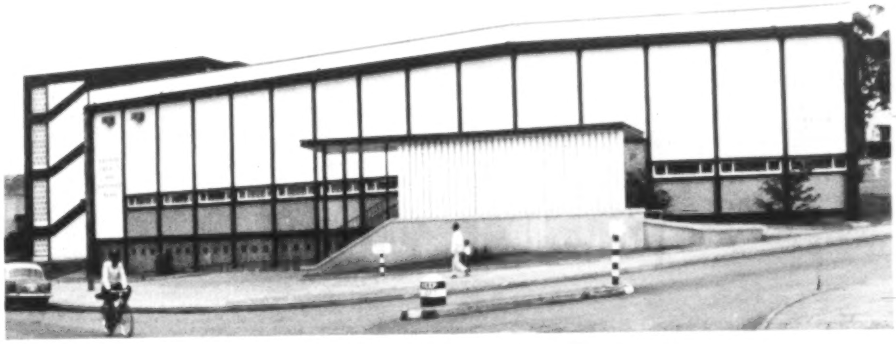

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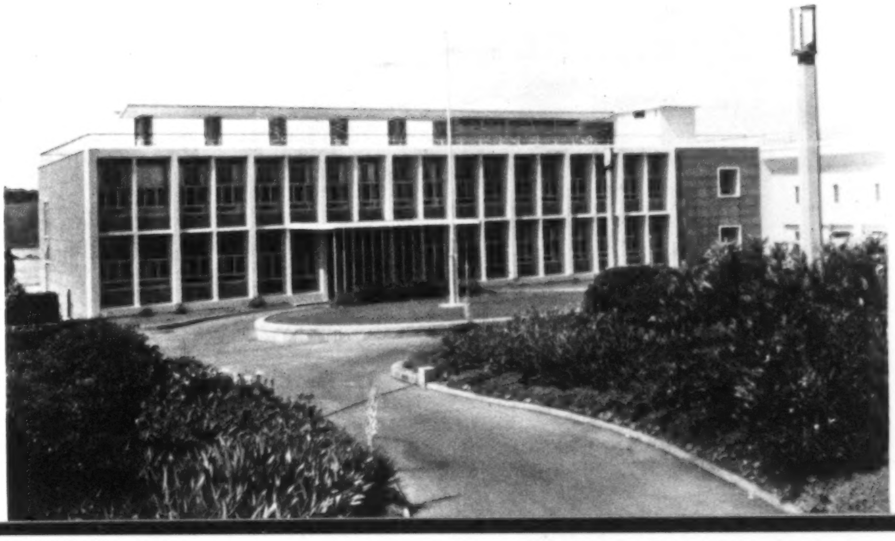

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3. office block, Owen Falls hydro-electric scheme (architect, H. L. Ford; consulting engineers, Sir Alexander Gibbs and Partners): for the Uganda Electricity Board. The four-storey building adjoins the power station with road access at two levels and contains offices, control-room, cable-chamber, canteens and welfare accommodation. Construction is reinforced concrete with deep exterior columns on north and south elevations to shade the walls and windows. Wall facing is precast concrete slabs with local granite aggregate.

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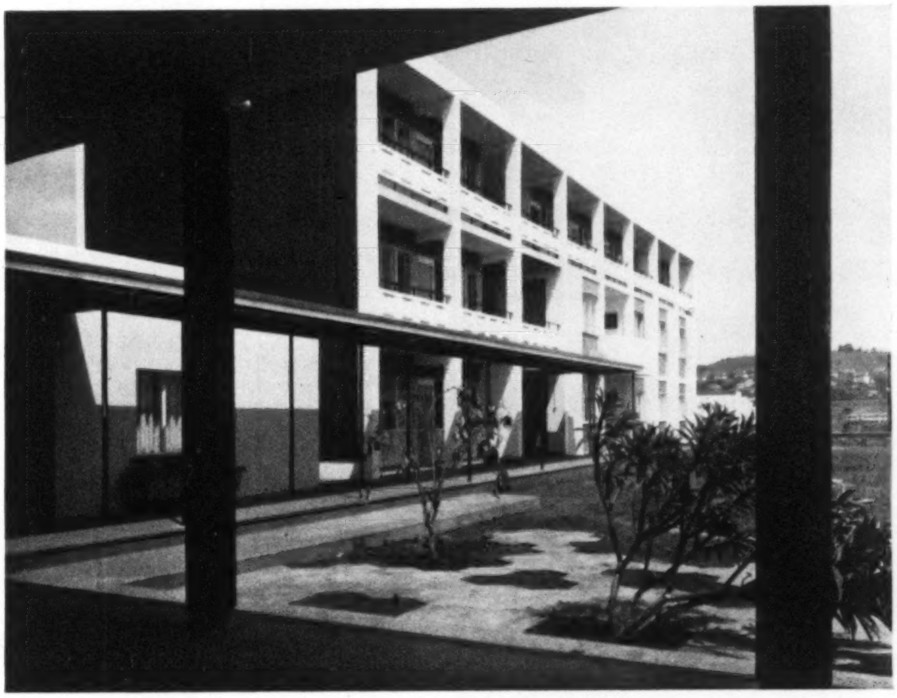

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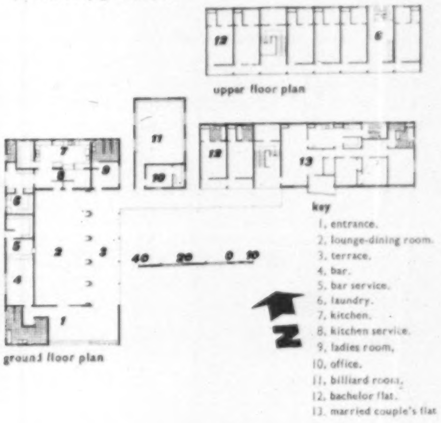

key

1, entrance.
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3, terrace.
4, bar.
5, bar service.
6, laundry.
7, kitchen.
8, kitchen service.
9, ladies room.
10, office.
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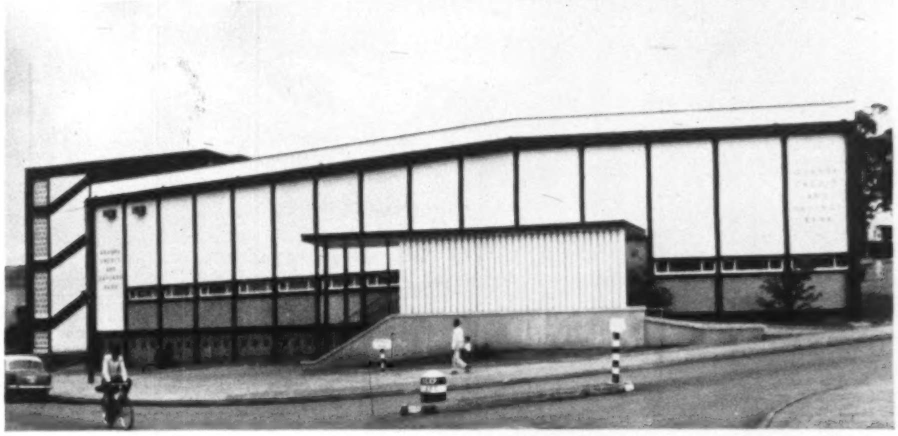

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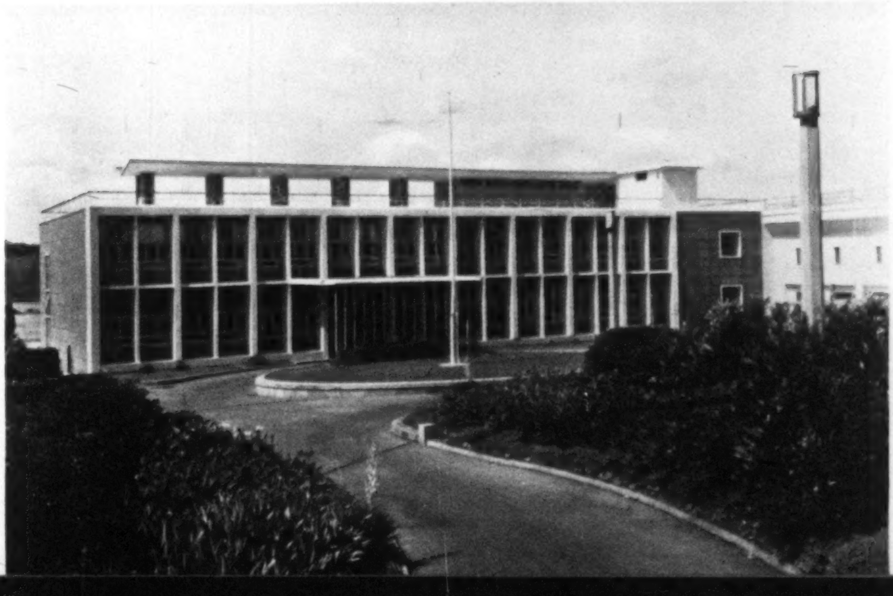

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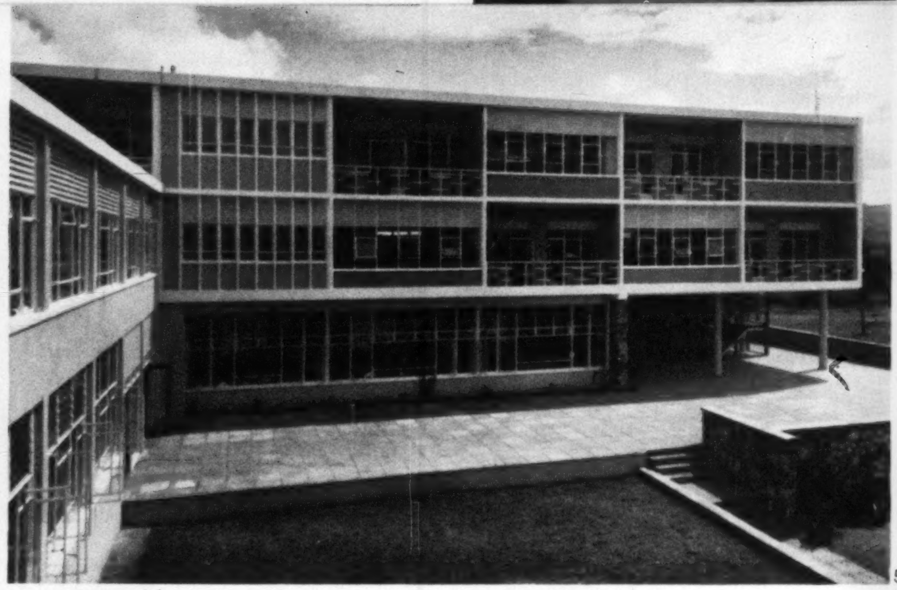
UGANDA

4

4, *village market at Kiwafu, near Entebbe (architect, Robert Browning) for the African Housing Division, Ministry of Social Development. It serves a village estate where Africans can buy a plot of land and build their own semi-traditional houses, mostly of mud and wattle. The roof; of locally made asbestos-cement sheeting, has tubular supports which also serve as rainwater-pipes. Walls are concrete blocks. Construction was by direct labour under the supervision of an African engineering assistant.*



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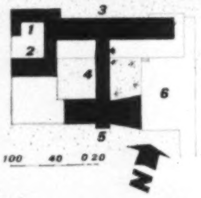
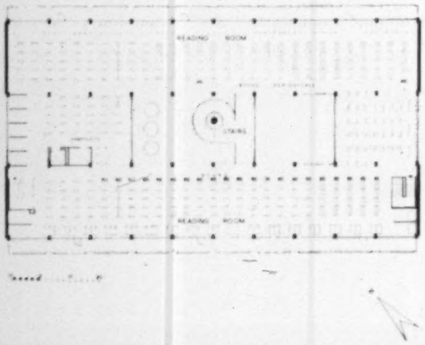


site plan, school at Mbale

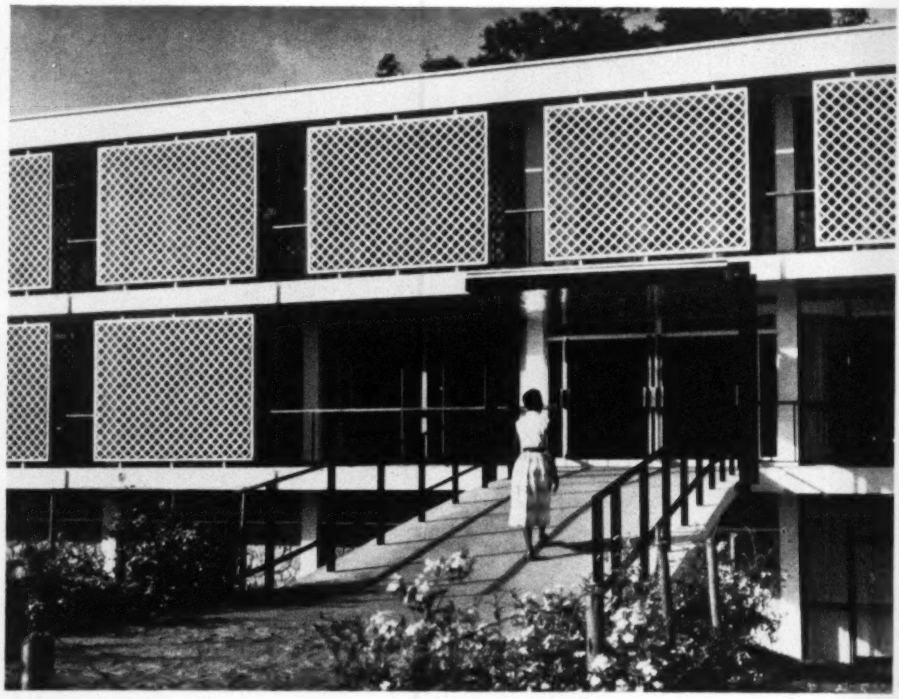
key

1, kitchen.
2, workshops.
3, living accommodation.
4, administration.
5, teaching block.
6, car park.

5 (*above*), *School of Hygiene, Mbale (architect, John Falconer of Deans and Partners) for the Director of Public Works: a residential school for 120 adult students being trained as health inspectors, etc. The photograph shows two storeys of dormitories and study-bedrooms above a ground-floor common-room. On the left is the administration wing.*



6, *library at Makerere College (the University College of East Africa) near Kampala (architects, Norman and Dawbarn). It houses 120,000 books and 300 readers and includes binding, printing and photographic departments. The plan (see main floor above) consists of two two-storey units separated by two courts, one open and one covered to form the stair and catalogue hall. The service rooms are in a lower ground floor. The library floors have verandahs along the two long sides screened by pierced ceramic grilles (see photograph, which shows the main entrance). The building has a reinforced concrete frame. The end walls are of precast concrete slabs with large windows protected by metal louvres.*

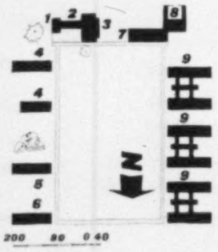


6

7, *residential secondary school (Teso College, Aloet) near Soroti, a hot, barren and rocky part of Uganda (architect, John Falconer of Deans and Partners). The buildings (see plan below), accommodating 240 boys, are planned round a square on a flat site. The photograph shows the library and administration from the west, with the assembly-hall beyond.*

key

1, library.
2, administration.
3, assembly hall.
4, classroom blocks.
5, practical rooms.
6, laboratories.
7, dining hall.
8, kitchen.
9, dormitory blocks.



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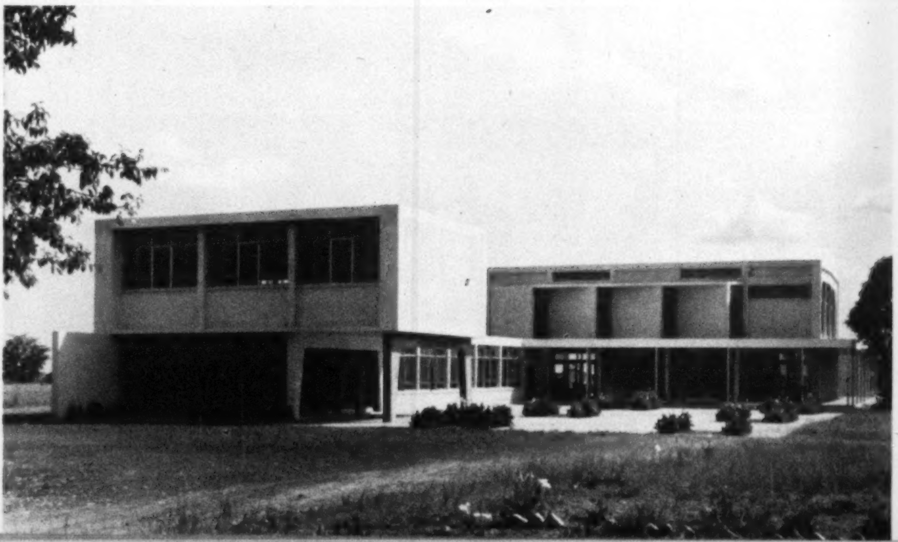
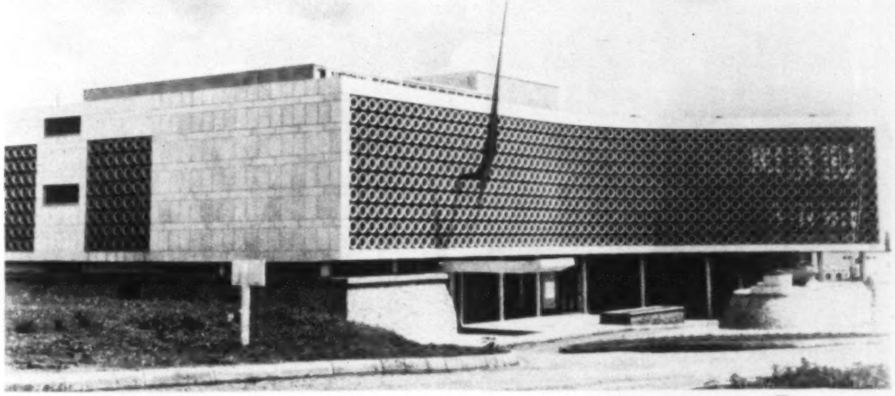
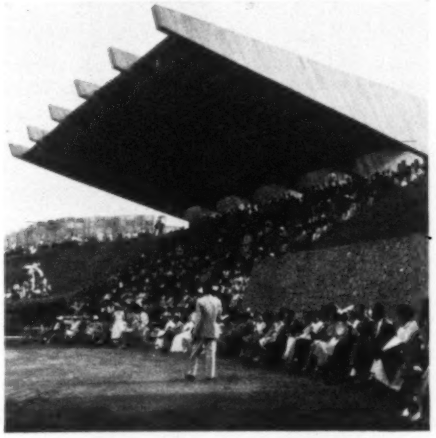


8, *National Theatre and cultural centre, Kampala (architects, Peatfield and Bodgener). The theatre itself seats 400 and the building (see plan beneath the photograph) also contains offices, libraries and accommodation for various cultural societies. Construction is a reinforced concrete frame faced with terrazzo slabs and grilles incorporating East African white marble chips. Behind the grilles the window walls are in local cedar framing.*


8

9, *cricket grandstand at the headquarters of the Uganda Sports Union, Kampala (architects, Peatfield and Bodgener; engineer, Colin Harris). The headquarters also includes tennis and hockey grounds, a large indoor stadium, a club-house and hostel accommodation. The cricket grandstand, which seats 1,200, has a cantilevered roof clad with Kenya red cedar and roofed with asbestos sheeting on teak joists. Seating is precast concrete.*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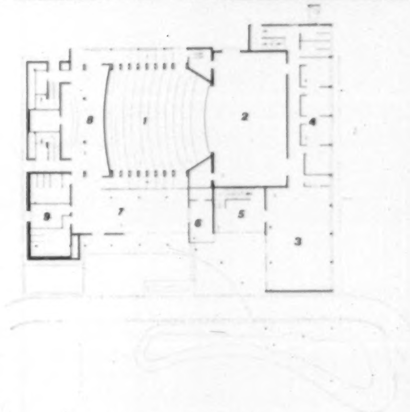
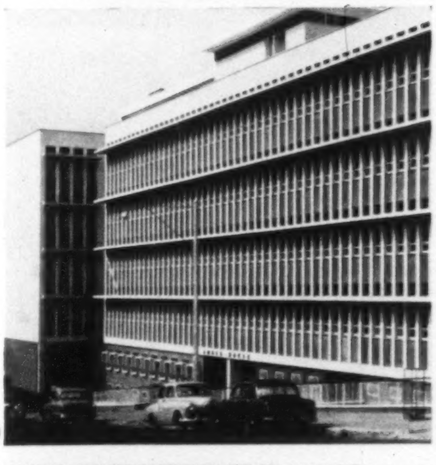


ground floor plan, National Theatre, Kampala

key 1, auditorium. 2, stage. 3, green room. 4, dressing rooms. 5, office entrance hall. 6, box office. 7, entrance foyer. 8, bar foyer. 9, manager's office.

10, *office building (Amber House), Kampala (architects, Moross and Graff). On a steeply sloping site in the business centre of Kampala, it houses the offices of the Uganda Electricity Board and the Lint and Coffee Marketing Boards. Three- four- and five-storey wings are planned for maximum air circulation and protection from the east and west sun. There is a basement parking garage for 100 cars. The reinforced concrete frame is clad with white and grey precast terrazzo slabs.*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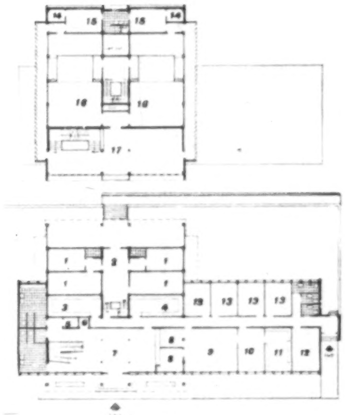
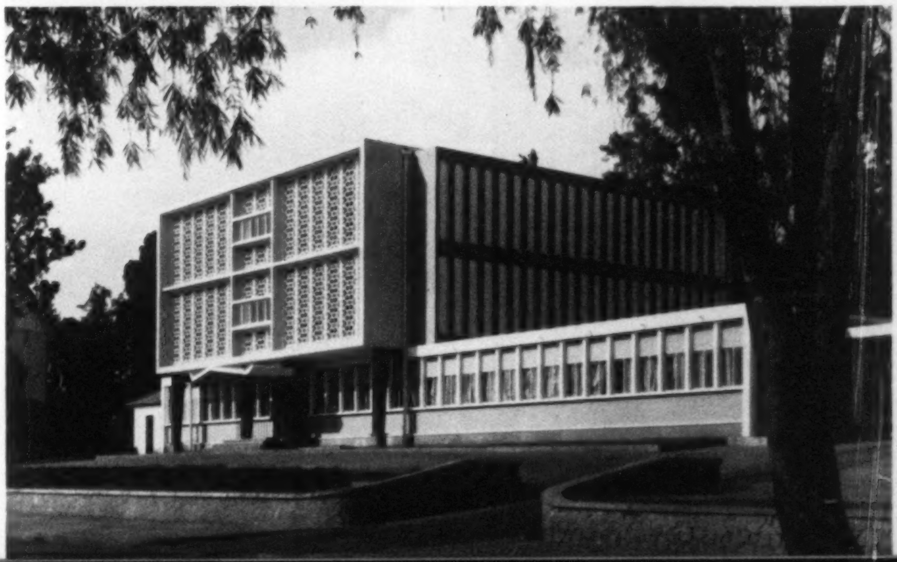
11 *(below), magistrates' courts, Kampala (architect, C. G. Andrews, chief architect Public Works Department; assistant in charge, J. E. C. Callaghan). The building adjoins the new police headquarters and contains four small courts. They are on the first and second floors (see plans, bottom left), with the entrance-hall, offices and cells on the ground floor. The building has a reinforced concrete frame. Concrete grilles and louvres protect the main rooms from the sun.*

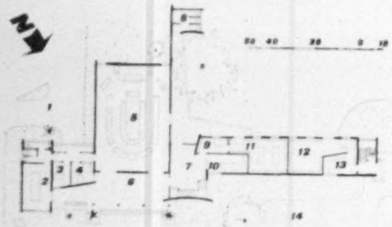


ground and first floor plans, magistrates' court, Kampala

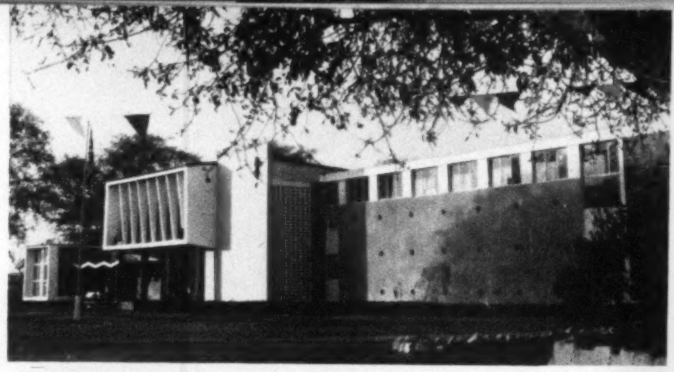
key 1, cells. 2, duty room. 3, court exhibits. 4, police exhibits. 5, meters. 6, telephone. 7, entrance hall. 8, public reception. 9, general office. 10, chief clerk. 11, library. 12, advocates. 13, offices. 14, stores. 15, magistrates. 16, courts. 17, public waiting.


11

TANGANYIKA

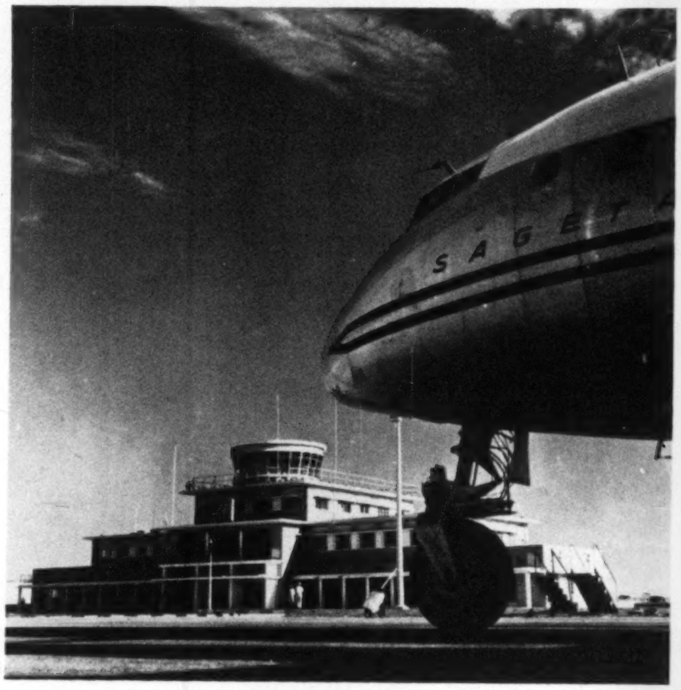


key
1, members' car park.
2, committee room.
3, 4, cloaks.
5, council chamber.
6, entrance.
7, hall.
8, lavatories.
9, medical superintendent.
10, correspondence.
11, medical store.
12, equipment store.
13, foreman.
14, visitors' car park.



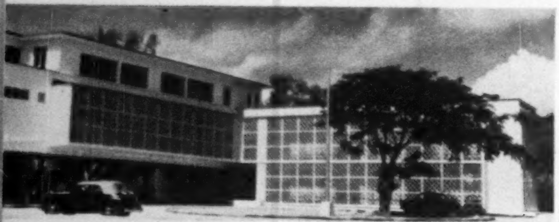
12

12, local government headquarters, Singida (architects, French and Hastings; built under the supervision of the Tanganyika Public Works Department). The entrance verandah, with a public gallery over it, leads directly into the council chamber—see plan above. On one side are committee-rooms, etc.; on the other a two-storey wing of offices and stores. The photograph is from the north, the prevailing wind being south or south-east.



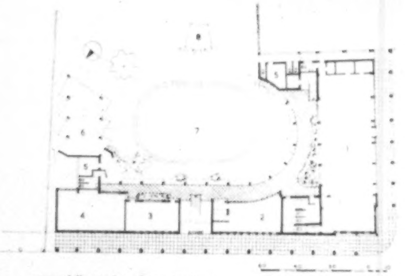
13

13 (right), terminal building, Dar es Salaam airport (architects, Public Works Department). It handles 5,000 passengers a month. On the ground floor are the departure, waiting and customs halls and airline offices; on the first floor a restaurant, bar, kitchen and meteorological offices; on the second floor radio control. Walls are load-bearing concrete block and floors precast reinforced concrete T-beams. The control-tower is air-conditioned.

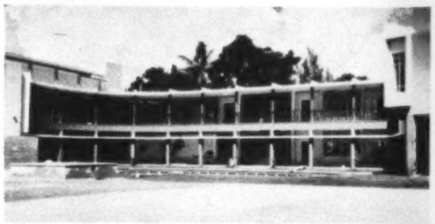


14

14 (above), European primary school, Dar es Salaam (architects, C. A. Bransgrove and Partners): from the main approach, with covered play area on the left (classrooms over) and two-storey classroom wing on the right. There are eight classrooms altogether, all with pierced walls of precast concrete blocks to give through ventilation, together with staff-rooms, cloakrooms and (on the second floor) two staff flats. The frame is reinforced concrete.

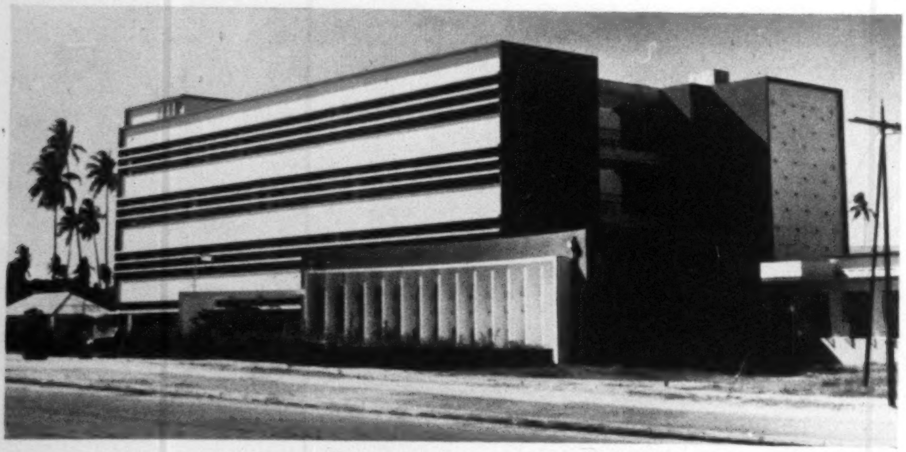


ground floor plan, Goan Institute
key 1, commercial premises. 2, club office. 3, committee room. 4, table tennis room. 5, store. 6, children's play area. 7, open-air dance floor. 8, band stand.



15

15, Goan Institute, Dar es Salaam (architect, A. B. Almeida): a club in the centre of the town for the Goan community. The main club rooms overlook an enclosed garden, which has a sunk open-air dance floor—see plan on left. Construction is reinforced concrete with concrete block walls and perforated and louvred concrete screens.



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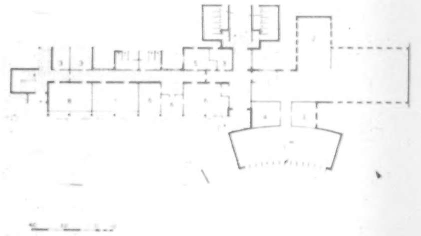
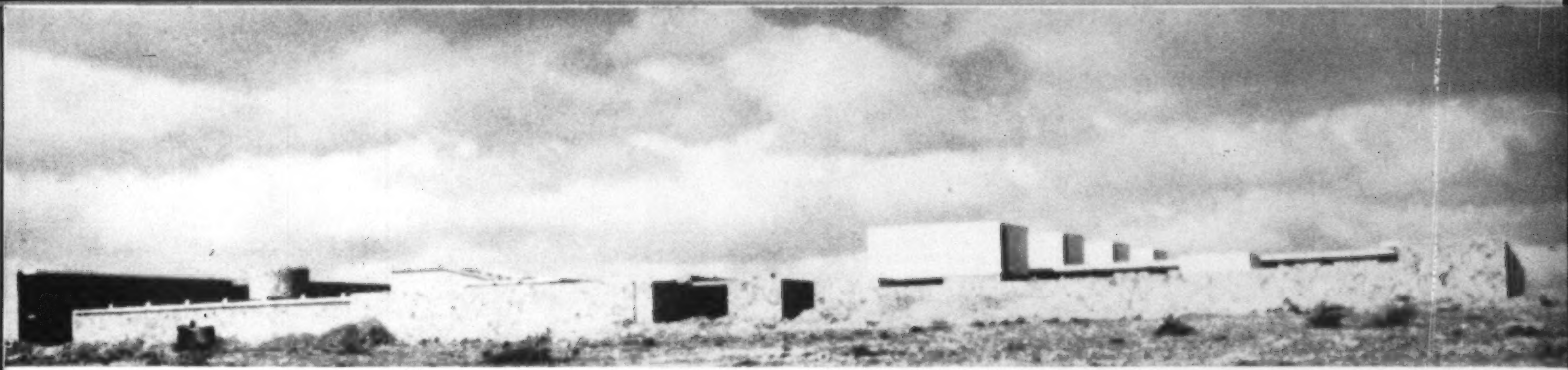


key 1, library. 2, stacking room. 3, store. 4, bookbinding. 5, bursar. 6, office. 7, staff room. 8, committee room.

16, technical institute, Dar es Salaam (architect, A. B. Almeida): the main classroom and administrative block, flanked by the single-storey reference library and reading room, with projecting entrance hall—see plan above. Behind is a hostel block.



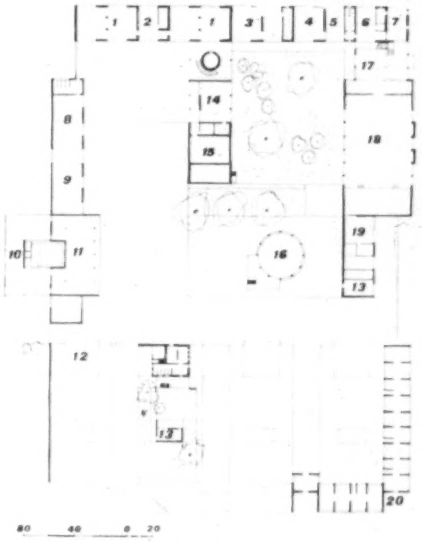
17

SOMALILAND

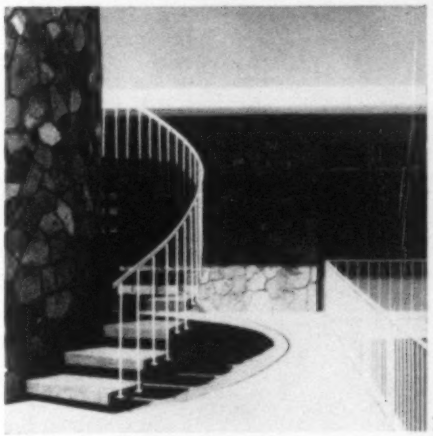
17, boys' secondary school, Sheikh (architect, Leslie Wright): a residential school planned as a walled enclosure. The various single-storey blocks of buildings look inwards to a paved garden, in the centre of which is a circular mosque with a saucer dome—see plan on right; the classroom wing has an upper floor containing more classrooms and a lecture-theatre, reached by the circular staircase, 18. Walls are load-bearing stone. The school has been designed for vertical extension.

key

1, laboratories.
2, prep.
3, library.
4, staff room.
5, assistant principal.
6, principal.
7, office.
8, common room.
9, canteen.
10, kitchen.
11, dining room.
12, common room with master's study over.
13, prefects.
14, art room.
15, book store.
16, mosque.
17, entrance hall.
18, assembly hall.
19, workshops.
20, dormitories.



ground floor plan, secondary school, Sheikh

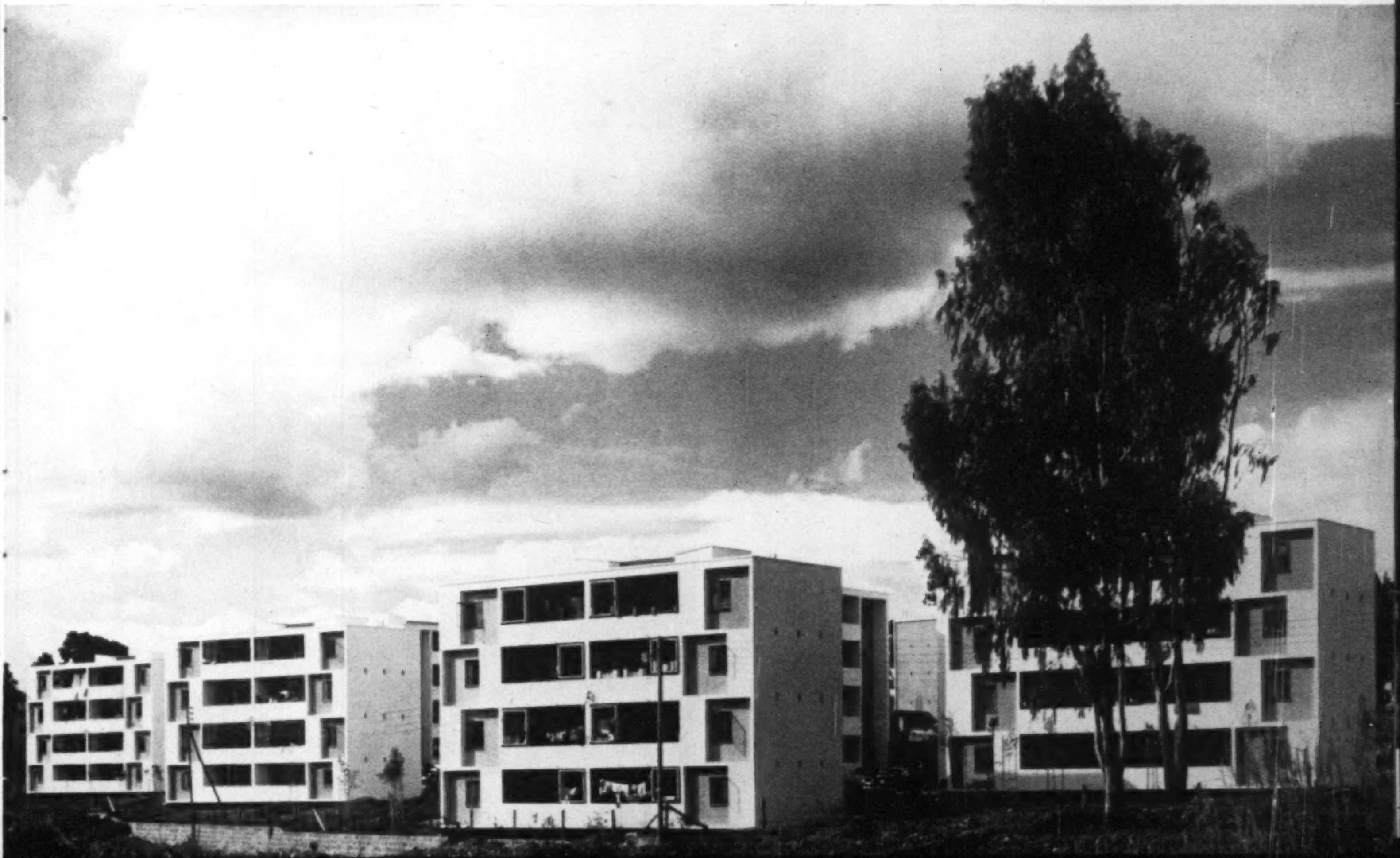


18

KENYA

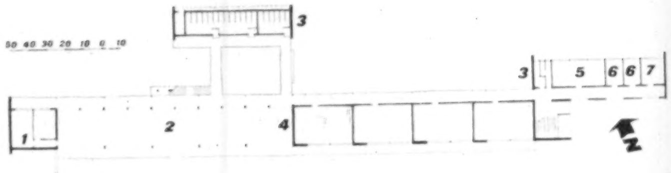
19 (below), Asian housing, Nairobi (architect, Idris Davies): a group of identical blocks of municipal flats with staircase access, each with two flats on each of four storeys.

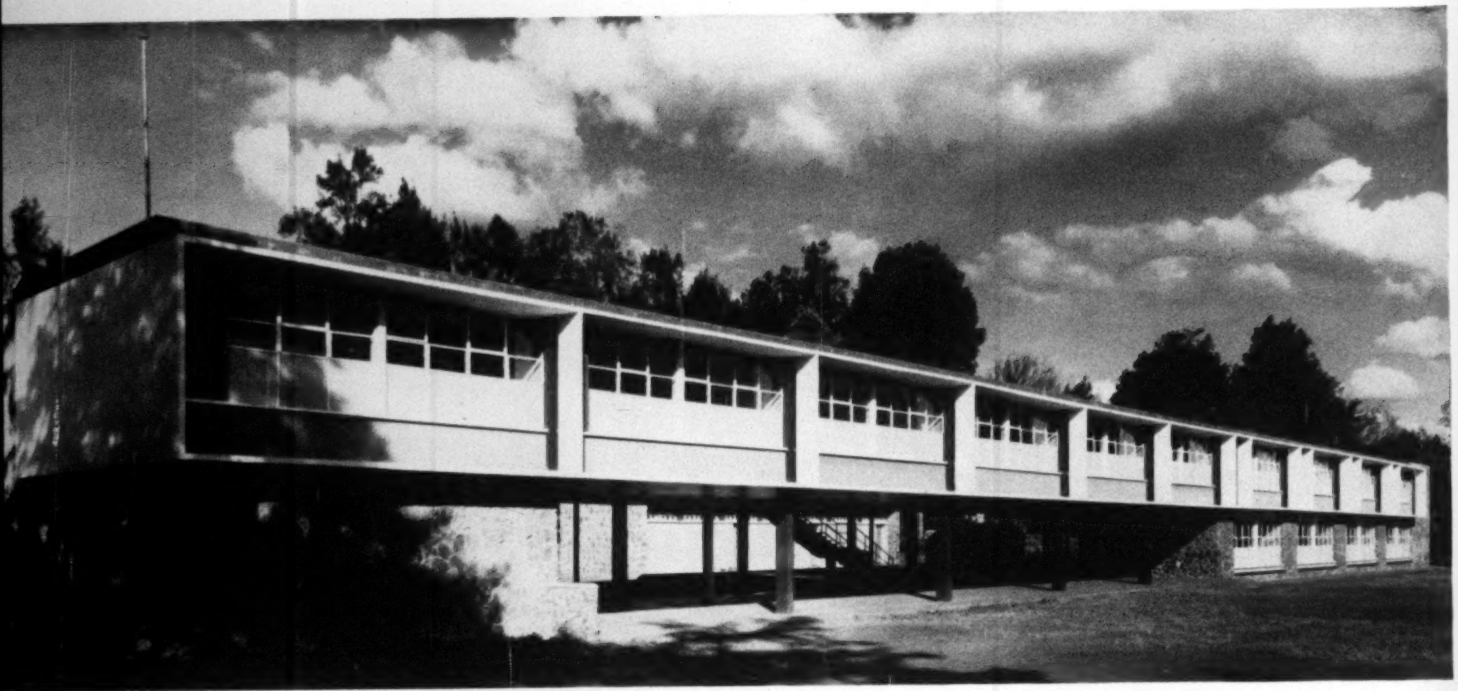
19



KENYA

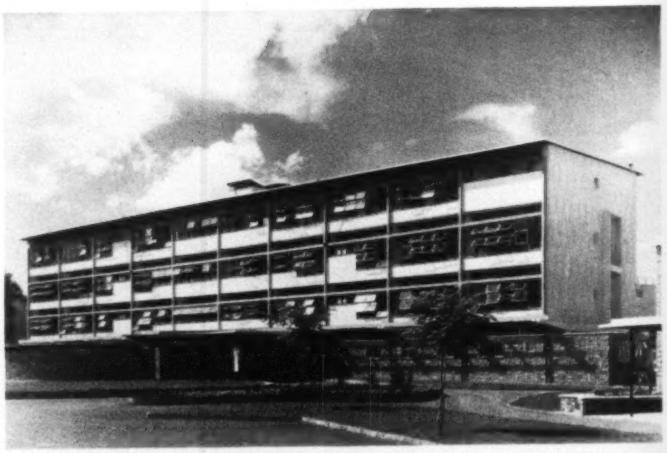
key
1, stores.
2, covered playground.
3, lavatory block.
4, kindergarten.
5, staff room.
6, clerks.
7, principal.





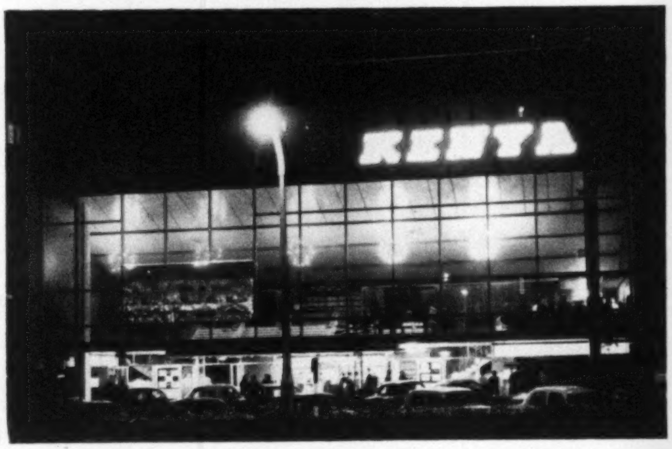
20

20, *Arya girls' senior school at Parklands, Nairobi (architects, T. G. Gedrych and Peer Abben); a two-storey building with ground floor partly open—see plan at top of page—of concrete construction with rubble stone ground floor walls.*



21

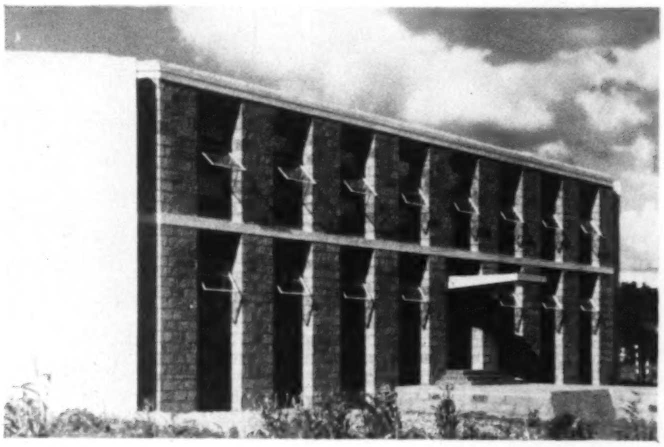
21, *Aga Khan hospital, Nairobi (architect, A. D. Connell). The photograph shows the south front of the four-storey ward block (four large and four small wards at each level totalling 120 beds). Behind it, linked to the ward block by a glazed lobby, is a fan-shaped service and operating block flanked by ramps leading to the upper floors of both blocks. Service circulation runs beneath it.*



22

22, *cinema in Government Road, Nairobi (architects, Blaker and McCullough), photographed at night showing the illuminated interior behind the all-glass façade. The panel behind the lettering is of ceramic mosaic. Construction is reinforced concrete with a steel truss roof.*

23 (below), Kenya Federation of Labour headquarters, Nairobi (architect, H. Richard Hughes): from the south west. The building, for Tom Mboya's trade unions, sited in the African part of Nairobi, has offices on the upper floor and is designed for the addition of a second office floor later. The assembly hall shown on the ground-floor plan below has also not yet been built. Construction is load-bearing stone piers, U-shaped for stability, with reinforced concrete floor and roof slabs.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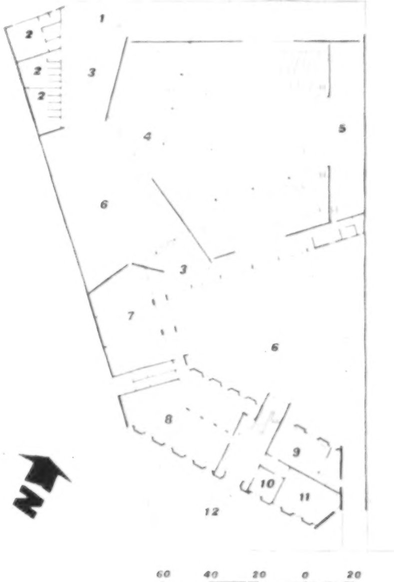
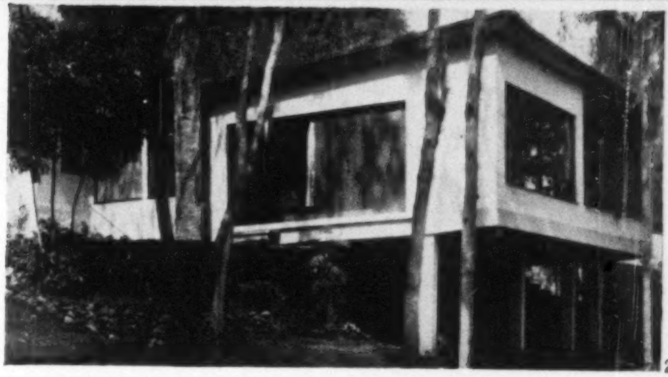
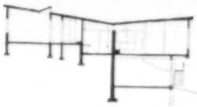


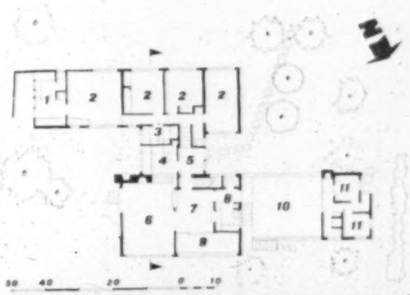
ground floor plan, headquarters for Kenya Federation of Labour
key
1, car park.
2, lavatories.
3, covered ways.
4, assembly hall.
5, platform.
6, courtyards.
7, classrooms.
8, library.
9, canteen.
10, reception.
11, office.
12, main entrance.

24 and 25, architect's own house at Nairobi (architect, H. Richard Hughes), designed to use a very steep site in a way that would separate the house conveniently into units—see plan and section. The living rooms are at the entrance level but on the north side, where there is a view across a waterfall at the bottom of the garden to the forest beyond, they are one floor up. The study, hall and bathroom form a link with the bedroom wing, which is a few feet higher. This has been planned for future expansion. The stone spine screens the backyard and servants' quarters from the entrance. Walls are concrete blocks; roofs are timber. 24, from the east, showing space beneath living-room which has now been walled in to form a drawing-office. 25, the dining-room, with view over the forest.


24

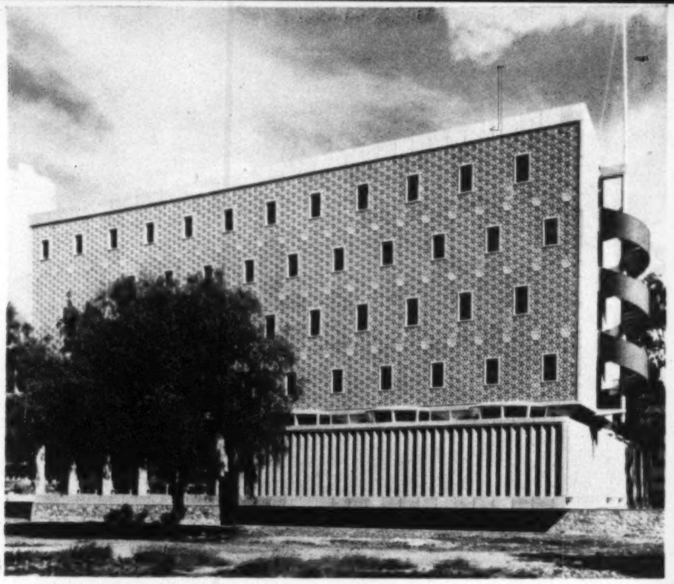


cross section and ground floor plan, house at Nairobi
key
1, dressing room.
2, bedrooms.
3, bathroom.
4, study.
5, hall.
6, living room.
7, dining room.
8, kitchen.
9, balcony.
10, yard.
11, servants.

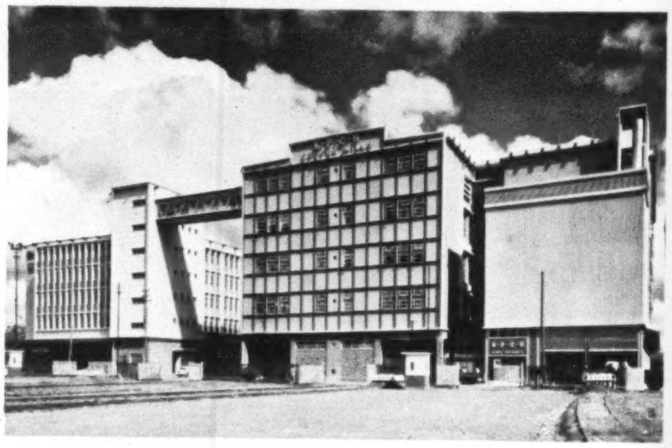


25

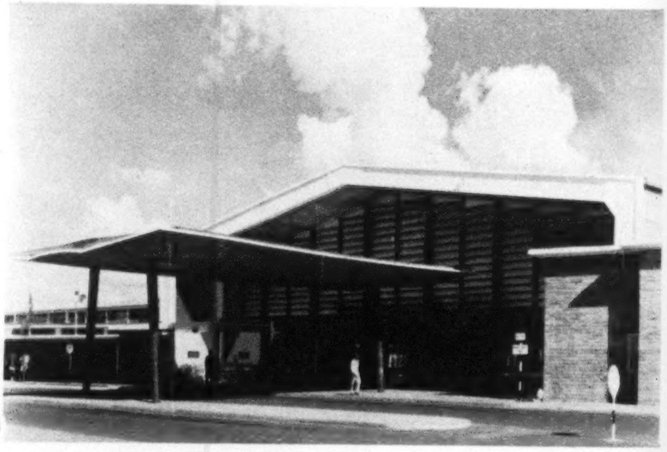
KENYA


26

26, Crown law offices, Nairobi (architect, A. D. Connell), a five-storey building with its whole north-west façade (shown in the photograph) and the corresponding façade on the opposite side covered by a concrete grille for sun-protection. The openings in the grille coincide with alternate windows behind, which are centrally pivoted. The upper floors contain offices either side of a central corridor, with a first-floor conference room the full width of the building at the far end and a two-storey library above it. The louvred ground-floor wall shown in the photograph marks the end of a single-storey public office projecting at right-angles behind the main building, with domed roof-lights.


27

27, coffee mills and warehouse, Nairobi (architect, Blackburne Norburn): a complex of buildings constructed over several years for the Kenya Planters' Co-operative Union. The newest part is that on the right: an additional mill block with dust-house in front of it. In the centre is a storage block connected to a warehouse by a bridge. An auction-hall also forms part of the scheme.


28

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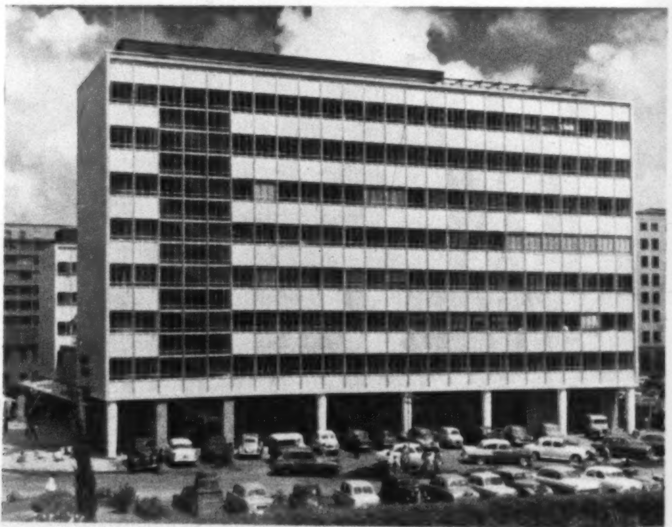
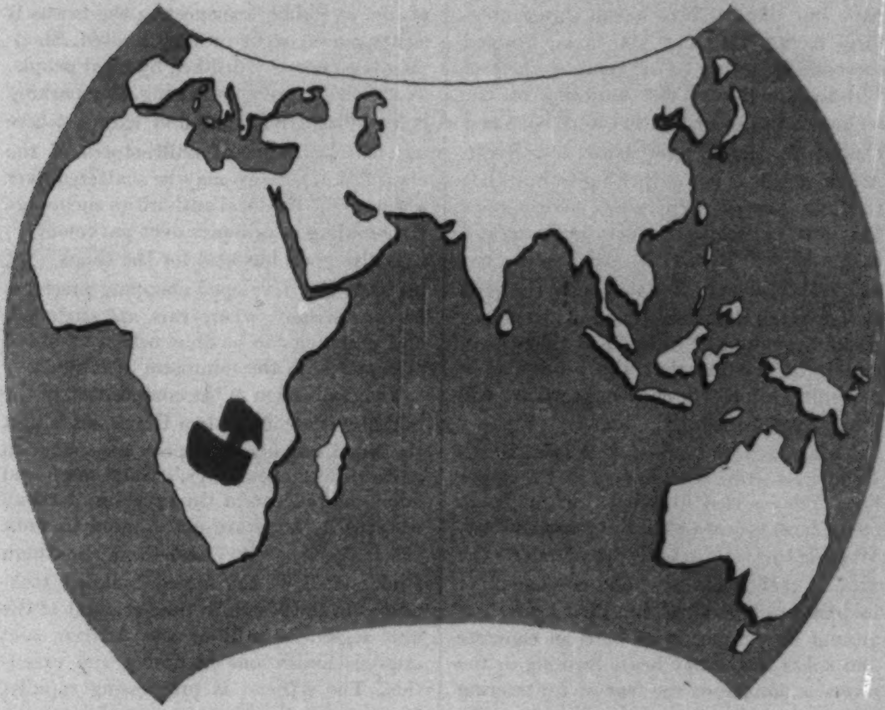

29

29, office building, Nairobi (architects, Jackson and Hill): an eight-storey curtain-walled block, typical of those now being constructed in the central business area.

R. K. Rutherford



THE RHODESIAS

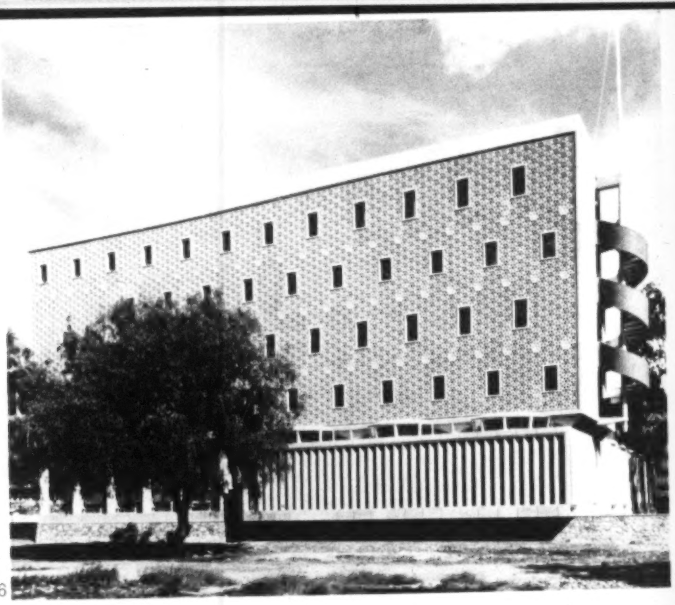
During the last twelve years, the growth of building in the Rhodesias, which with Nyasaland form the Federation, has been remarkable. The cement rendered shanties with corrugated iron roofs, the neo-Georgian 'official' buildings and the smattering of sham Cape Dutch, have given way to the modern buildings of ten, twenty and more storeys which now overshadow the 'tin shacks' of the pioneers. Yet the transformation of style, quality of material, general amenities and know-how has happened so quickly that people have had little time to think, developments have been rushed ahead by force of circumstances, and a trail of problems, some serious, has been created which will have to be resolved. Too rapid development does not produce the best results, and this can be said of the majority of the towns in the Rhodesias. The slowing down of the tempo over the past two years, though it may be only a passing phase, has not been wholly a bad thing, and the country has time now to have a breather and do some re-thinking.

The Rhodesias are in the sub-tropics on a land-locked plateau some 5,000 feet above the sea. In the dry season, the winter temperatures are low enough to need fires at night, and rise during the day into the seventies. This is followed by high winds and a gradual rise in temperature into the nineties, bringing small whirlwinds known as 'dust devils' to tear off roofs, and the hot 'suicide' month of October when tempers are at straining point. Eventually the weather breaks, accompanied by thunderstorms and intermittent torrential rain. In spite of this, it is a fine healthy climate.

Climate conditions the physical elements of building. There is need for protection from the hot west afternoon sun, the heavy rains, and the cool persistent winds of spring. Living-rooms are orientated to face the north sun in the winter months, and bedrooms to catch the cool night winds. Yet perhaps the most important need is the suppression of glare from both the sky and from sunlight reflected from the ground. To combat the effects of glare on domestic and working conditions usually involves capital outlay, but deserves special consideration when measured in terms of comfort and efficiency. It is fortunate that vegetation grows so quickly to form background screens. It is common for trees to reach a height of twenty feet in four years from seed.

Now that Africans are living in towns in large numbers, a complex of social, economic and human problems has come with the appearance of the urban African. Cut off from his traditional way of village life, he has to make for himself a fundamentally new kind of existence in unfamiliar surroundings. The African himself

KENYA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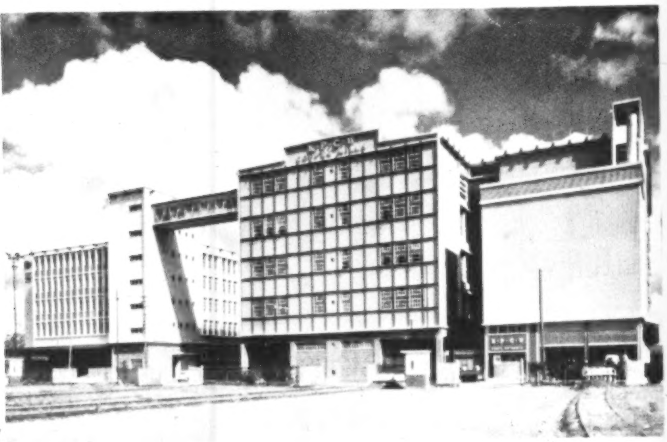
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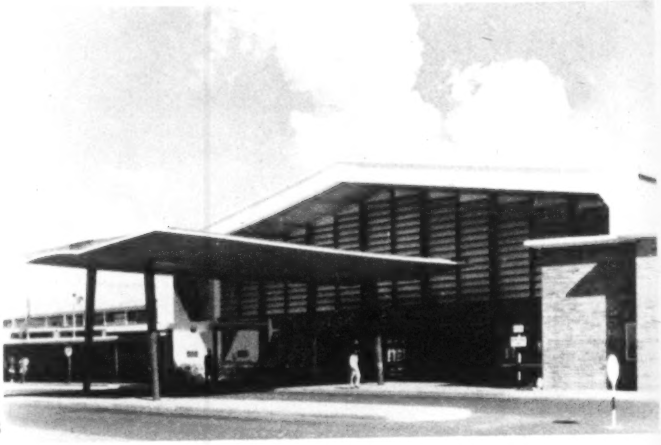
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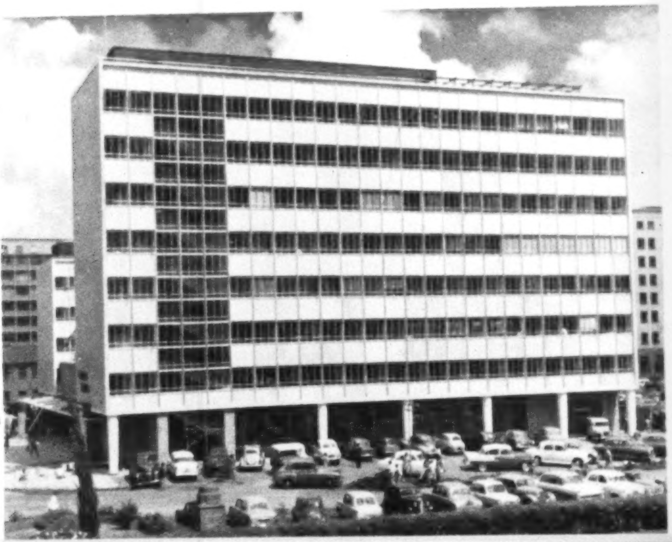
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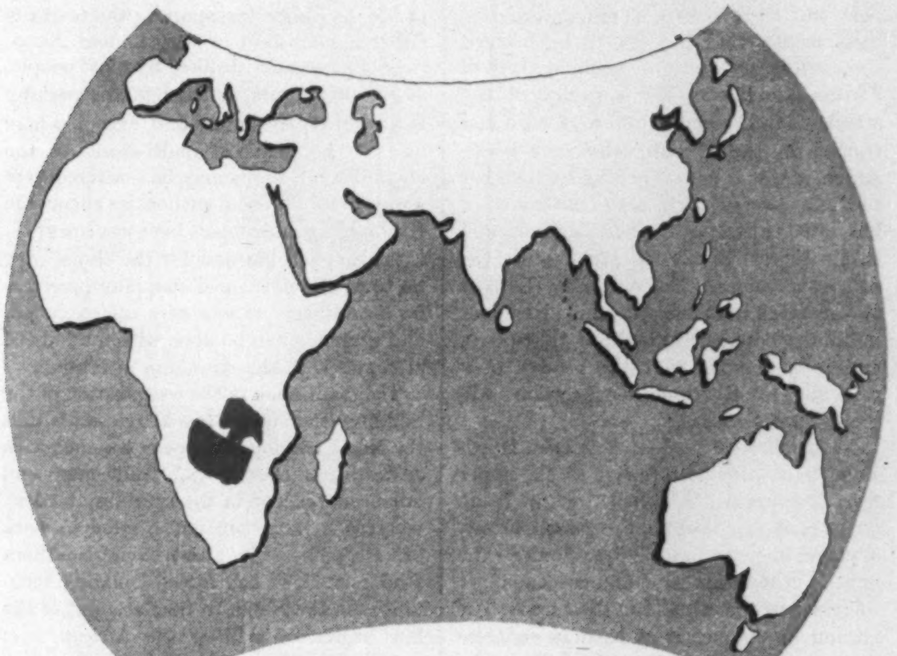
R. K. Rutherford



THE RHODESIAS

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Climate conditions the physical elements of building. There is need for protection from the hot west afternoon sun, the heavy rains, and the cool persistent winds of spring. Living-rooms are orientated to face the north sun in the winter months, and bedrooms to catch the cool night winds. Yet perhaps the most important need is the suppression of glare from both the sky and from sunlight reflected from the ground. To combat the effects of glare on domestic and working conditions usually involves capital outlay, but deserves special consideration when measured in terms of comfort and efficiency. It is fortunate that vegetation grows so quickly to form background screens. It is common for trees to reach a height of twenty feet in four years from seed.

Now that Africans are living in towns in large numbers, a complex of social, economic and human problems has come with the appearance of the urban African. Cut off from his traditional way of village life, he has to make for himself a fundamentally new kind of existence in unfamiliar surroundings. The African himself should be best suited to evolve a style of building to meet both the temperament and the conditions of his urban counterpart, but there is here a gulf in architectural feeling that has yet to be bridged successfully, owing to the complete lack of African architects. The majority of the architects in the Federation were born and trained in the British Isles and South Africa, and it is not surprising to find that the influence of their early environment has found expression in their buildings and that a typical Rhodesian architecture has not yet developed. Yet it is only the past twelve years that has seen this prodigious initial development in building take place, and it is possible that the growth of a recognizable Rhodesian expression will soon be discernible.

Nature is hard in Central Africa. Hardwood trees grow with foliage at the upper level like knurled umbrellas out of reach of the bush fires that kill the growth below. Wood-eating termites live under the ground in their millions, and can endanger foundations when building their nests. The ground in summer is as hard as concrete and splits in the dry heat. Bathing in the rivers is dangerous for fear of contracting bilharzia which eats away one's intestines. One expects rugged conditions in Africa, and one would expect the European buildings to be different to those in temperate climates. Yet go to the suburbs of any town in the Rhodesias and the general run of houses is fundamentally like those one will find in England and South Africa. Perhaps this shows the European's desire to turn his back on a natural environment that is foreign to his inherent background. The wild flowers in the bush have very vivid colours to counteract the strong sunlight that drains the colour from vegetation. As a parallel, it is noticeable how Africans like to wear bright clothes, and colours are used on buildings that would be considered harsh in temperate climates.

The car is an essential and not a luxury of life, as public transport in the towns is either non-existent or very limited. Shopping is a necessity disliked by most people, as it is hot, dusty and tiring. Car parking is an elusive business, and except where use can be made of multi-stores of the cheaper kind, shops may be scattered over a wide area. The local authorities encourage the building of canopies over pavements—it is also good business for the shops—yet no town has developed shopping precincts for pedestrians, where cars are excluded, and shopping can be done within a limited area and with the minimum of fatigue.

The distinction in the composition of the building trade in the two Rhodesias is that the North employs European foremen with Africans as 'boss-boys,' tradesmen and labourers (except in the specialist trades), whereas Africans are not allowed to work as tradesmen in towns in Southern Rhodesia. This has forced building techniques in the North to take account of the low degree of skill of the African, and imposes limitations in design and execution. The African is progressing rapidly, however, and with the general improvement in local building materials, more advanced designs are now possible.

The basic building materials are found locally. Some excellent facing bricks are now made in Southern Rhodesia, but the common brick of the Rhodesias is still of poor quality, and there are no standards for strength, porosity or size; in fact, the lack of standards for materials generally makes building a more complex and hazardous operation, and adds to the eventual cost of maintenance. River and 'dambo' sand, lime and sandstone, iron ore, asbestos and coal are all found locally. Conifers are difficult to grow because of destruction by termites (though they are now being grown in Southern Rhodesia) and are expensive to import. Local hardwoods are not used to any great extent due to lack of facilities for seasoning and their extreme hardness in most cases. South Africa provides many of the finished building products, but these are now being manufactured to an ever-increasing extent in the Rhodesias. The high cost of transport of imported materials due to the long distances incurred can increase the cost of building disproportionately. It is a challenge to the architect to adapt himself to the limitations of materials, labour, constructional equipment and finance.

It is invigorating to live in a young country and to feel that, in spite of mistakes, one has a share in its growth. The Rhodesias have a sufficiently long period of development and experience behind them to weigh up their mistakes and good points, and the next decade may well be vital to the future pattern of development. High buildings are a commonplace and only the beginnings of what is to come. There are misgivings about the capability of the new grid towns to be able to absorb the traffic as the population and number of vehicles increase. It is not unusual for Europeans to have two cars, and Africans are beginning to become car owners. There is a feeling that there is no live 'heart' in the towns, a lack of character in the suburbs which are apt to sprawl and open spaces to disappear. The majority of houses are single storey with large gardens, a legacy from the days when land was easily obtainable and the saying was, 'Oh, but there is the whole of Africa to build in.' Economic forces are changing this attitude. The old parts of the towns are being rebuilt and concrete is replacing pisé and corrugated iron. The pattern is taking shape and has come to stay. This is a vital period of development.

NORTHERN RHODESIA

1, architect's own house at Ndola (architect, H. Cameron-Smith of W. D'Arcy Cathcart & Son), on a wooded site orientated to take advantage of distant easterly views. The core of the 28ft square plan (see plans on right) is a large brick chimney containing flues from barbecue and servants' quarters below and living-room fireplace. Screen wall between kitchen and dining space is also brick. Remaining construction is steel (for staircase and roof-ridge) and timber.

2 (right), architect's own house at North Rise, Ndola (architect, Norman Hunt): car port and open living and dining areas on ground floor; three bedrooms, study and living rooms on first floor, all facing east and fully glazed (see photograph) with service rooms behind. Construction is a light steel frame, timber and local stone.

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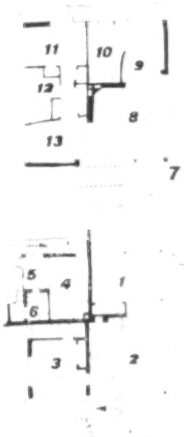
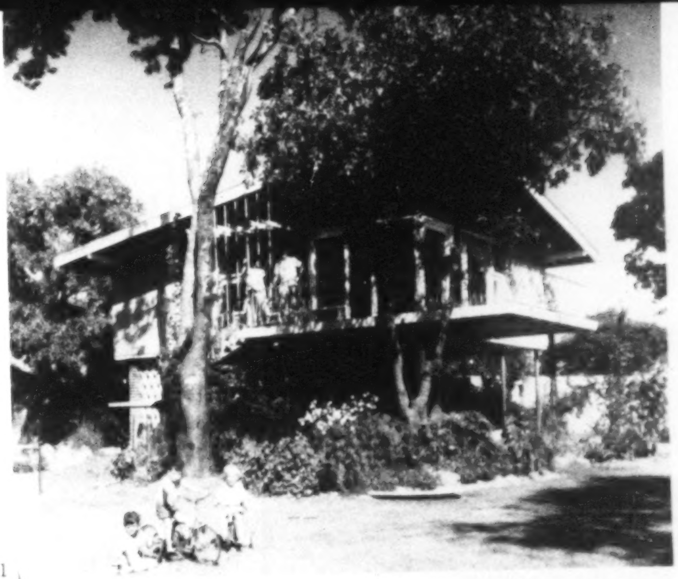
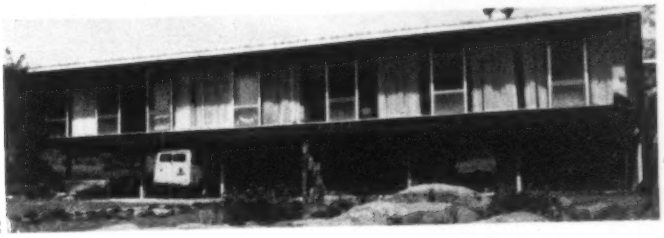


key

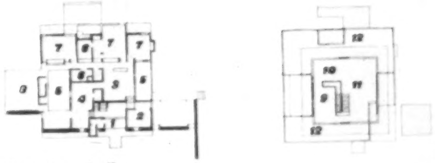
1. car port
2. court
3. future room
4. servant
5. laundry
6. lavatory
7. balcony
8. sitting area
9. dining area
10. kitchen
11. children's room
12. bathroom
13. bedroom



1



2

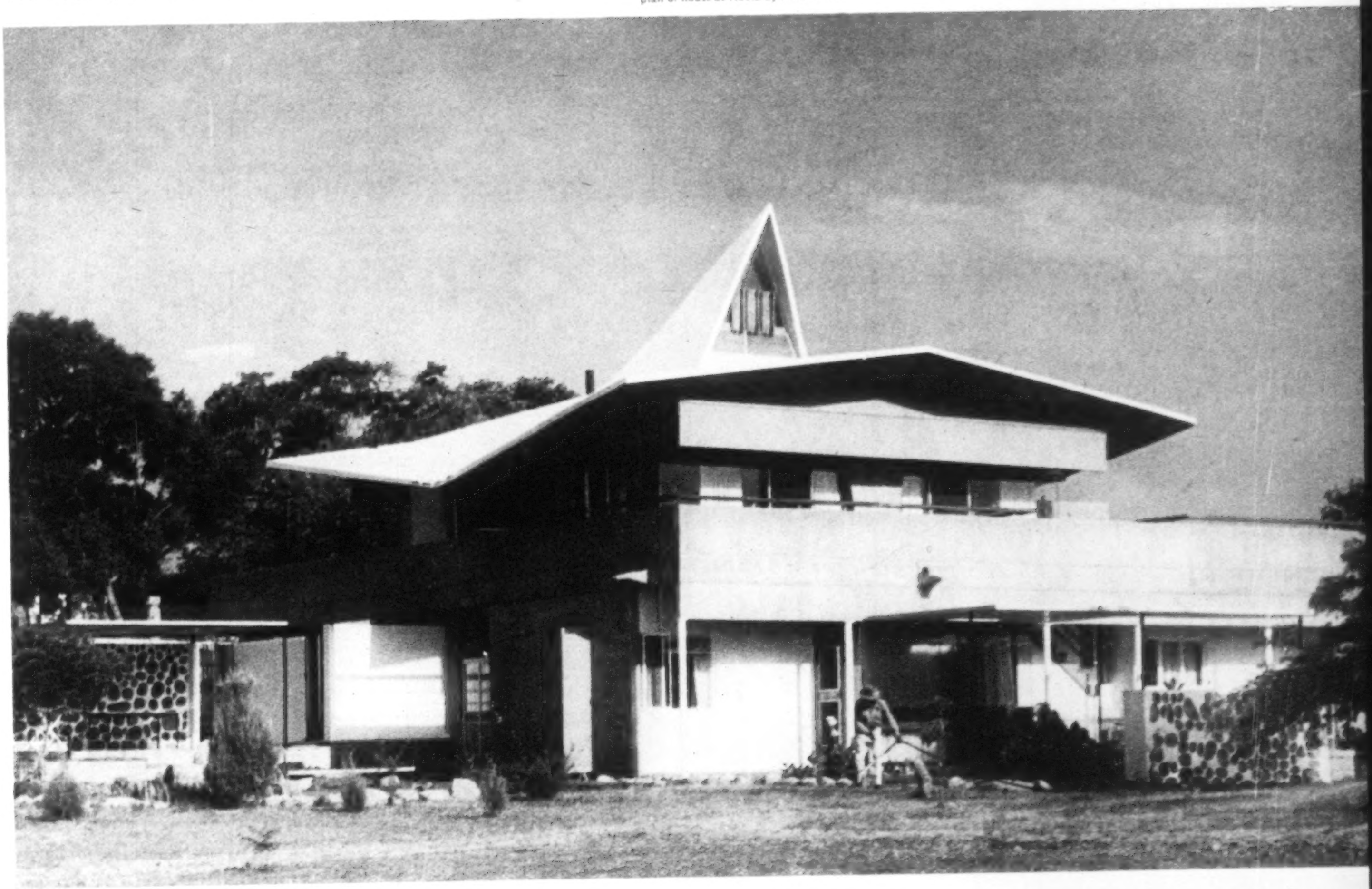


plan of house at Ndola by Julian Elliot

key

1. entrance.
2. study.
3. family room.
4. kitchen.
5. courts.
6. bathrooms.
7. bedrooms.
8. garage.
9. dining.
10. music.
11. living.
12. terraces.

3



should be best suited to evolve a style of building to meet both the temperament and the conditions of his urban counterpart, but there is here a gulf in architectural feeling that has yet to be bridged successfully, owing to the complete lack of African architects. The majority of the architects in the Federation were born and trained in the British Isles and South Africa, and it is not surprising to find that the influence of their early environment has found expression in their buildings and that a typical Rhodesian architecture has not yet developed. Yet it is only the past twelve years that has seen this prodigious initial development in building take place, and it is possible that the growth of a recognizable Rhodesian expression will soon be discernible.

Nature is hard in Central Africa. Hardwood trees grow with foliage at the upper level like knurled umbrellas out of reach of the bush fires that kill the growth below. Wood-eating termites live under the ground in their millions, and can endanger foundations when building their nests. The ground in summer is as hard as concrete and splits in the dry heat. Bathing in the rivers is dangerous for fear of contracting bilharzia which eats away one's intestines. One expects rugged conditions in Africa, and one would expect the European buildings to be different to those in temperate climates. Yet go to the suburbs of any town in the Rhodesias and the general run of houses is fundamentally like those one will find in England and South Africa. Perhaps this shows the European's desire to turn his back on a natural environment that is foreign to his inherent background. The wild flowers in the bush have very vivid colours to counteract the strong sunlight that drains the colour from vegetation. As a parallel, it is noticeable how Africans like to wear bright clothes, and colours are used on buildings that would be considered harsh in temperate climates.

The car is an essential and not a luxury of life, as public transport in the towns is either non-existent or very limited. Shopping is a necessity disliked by most people, as it is hot, dusty and tiring. Car parking is an elusive business, and except where use can be made of multi-stores of the cheaper kind, shops may be scattered over a wide area. The local authorities encourage the building of canopies over pavements—it is also good business for the shops—yet no town has developed shopping precincts for pedestrians, where cars are excluded, and shopping can be done within a limited area and with the minimum of fatigue.

The distinction in the composition of the building trade in the two Rhodesias is that the North employs European foremen with Africans as 'boss-boys,' tradesmen and labourers (except in the specialist trades), whereas Africans are not allowed to work as tradesmen in towns in Southern Rhodesia. This has forced building techniques in the North to take account of the low degree of skill of the African, and imposes limitations in design and execution. The African is progressing rapidly, however, and with the general improvement in local building materials, more advanced designs are now possible.

The basic building materials are found locally. Some excellent facing bricks are now made in Southern Rhodesia, but the common brick of the Rhodesias is still of poor quality, and there are no standards for strength, porosity or size; in fact, the lack of standards for materials generally makes building a more complex and hazardous operation, and adds to the eventual cost of maintenance. River and 'dambo' sand, lime and sandstone, iron ore, asbestos and coal are all found locally. Conifers are difficult to grow because of destruction by termites (though they are now being grown in Southern Rhodesia) and are expensive to import. Local hardwoods are not used to any great extent due to lack of facilities for seasoning and their extreme hardness in most cases. South Africa provides many of the finished building products, but these are now being manufactured to an ever-increasing extent in the Rhodesias. The high cost of transport of imported materials due to the long distances incurred can increase the cost of building disproportionately. It is a challenge to the architect to adapt himself to the limitations of materials, labour, constructional equipment and finance.

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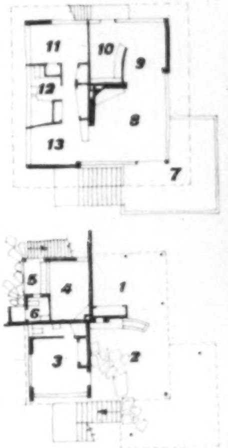

key
1. car port.
2. court.
3. future room.
4. servant.
5. laundry.
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7. balcony.
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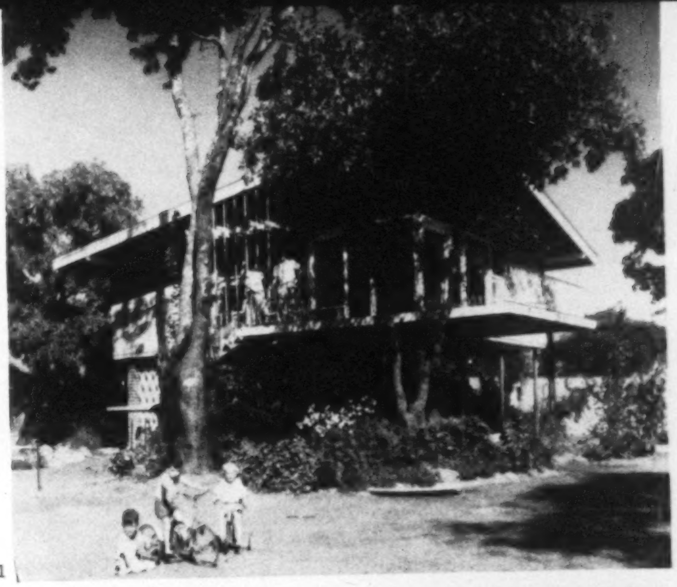

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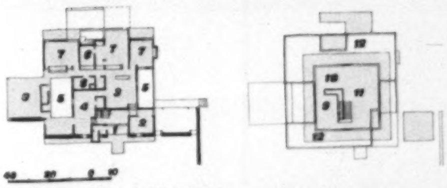

plan of house at Ndola by Julian Elliot

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1. entrance.
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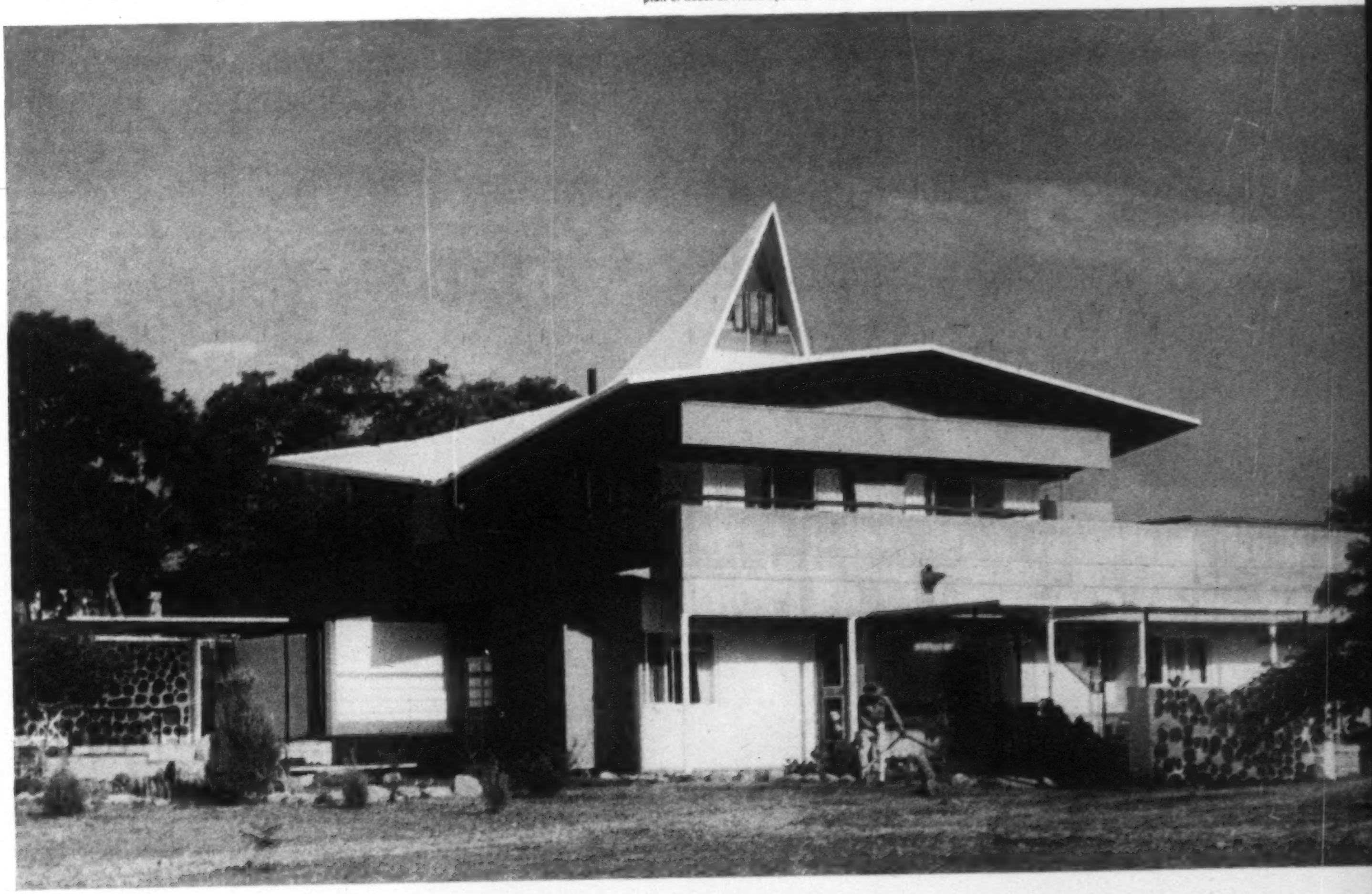
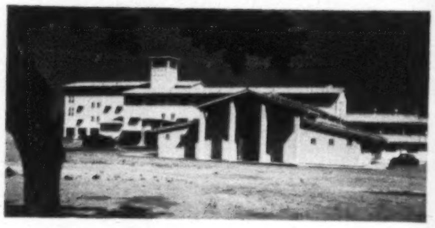
3

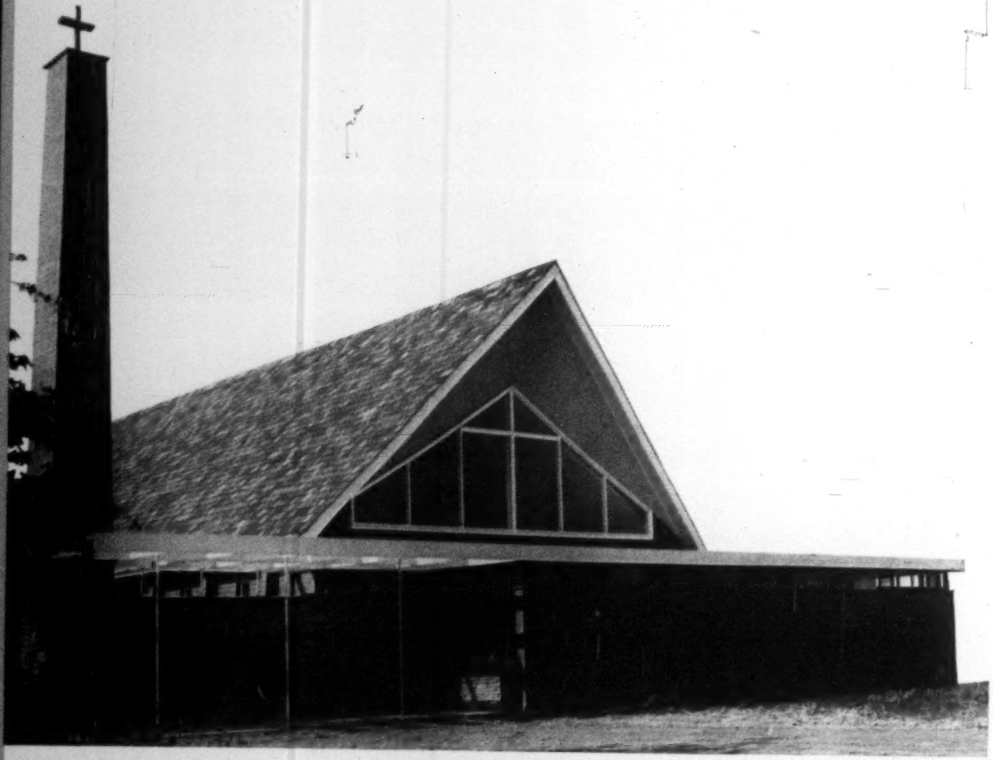


NORTHERN RHODESIA



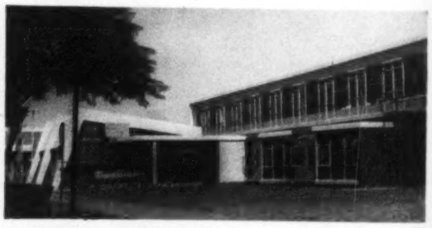
4

4, Ridgeway Hotel, Lusaka (architect, Geoffrey A. Jellicoe)—fully illustrated, AR, February, 1954. The site is a tree-clad spur of a hill above the lower town. Bedrooms occupy the two upper floors, planned in two parallel wings, below which is the reception area, the main lounge and the offices, etc. The other public rooms are single-storey. The photograph shows the ballroom with, beyond it, the bedroom wings and central water tower. There is also a restaurant with open-air verandah overlooking a pool. Construction is reinforced concrete with brick infill panels, rendered externally and colour-washed pink. Roofs are timber covered with asbestos sheeting. Interior decoration and furnishing are by Denis Lennon.



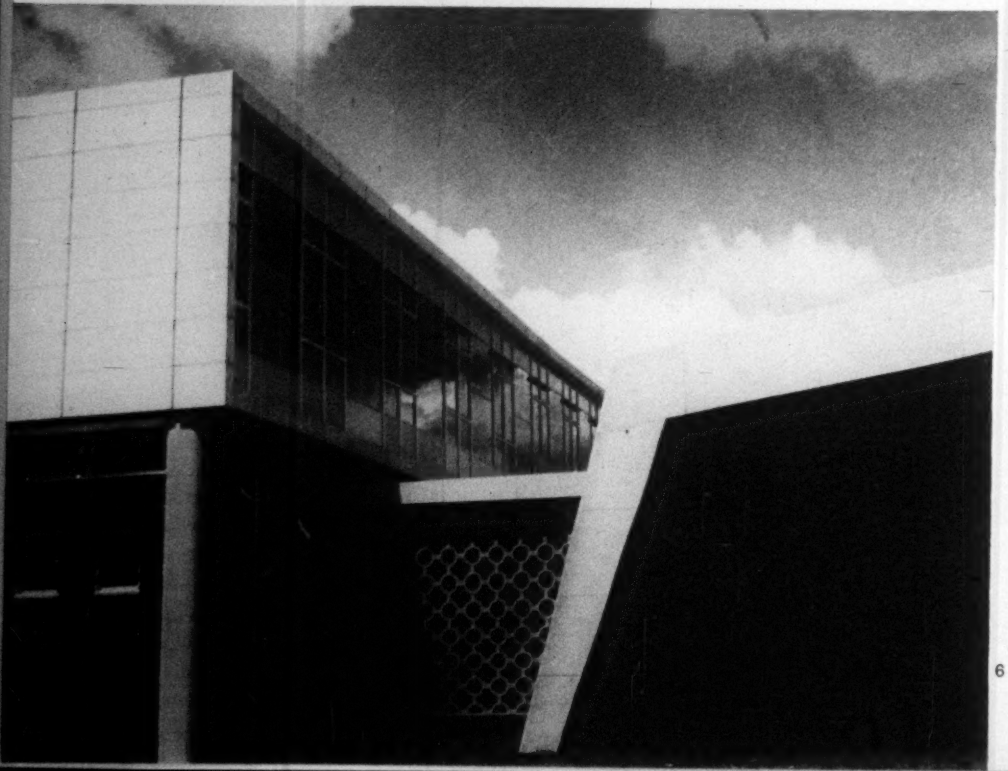
5

5 (left), church at Lusaka (architects, Rinaldi, MacDonald and Harvey); for the Seventh Day Adventists. Construction is light steel frame and timber, with screen walls and tower in brick and local stone. The roof is covered with shingles.

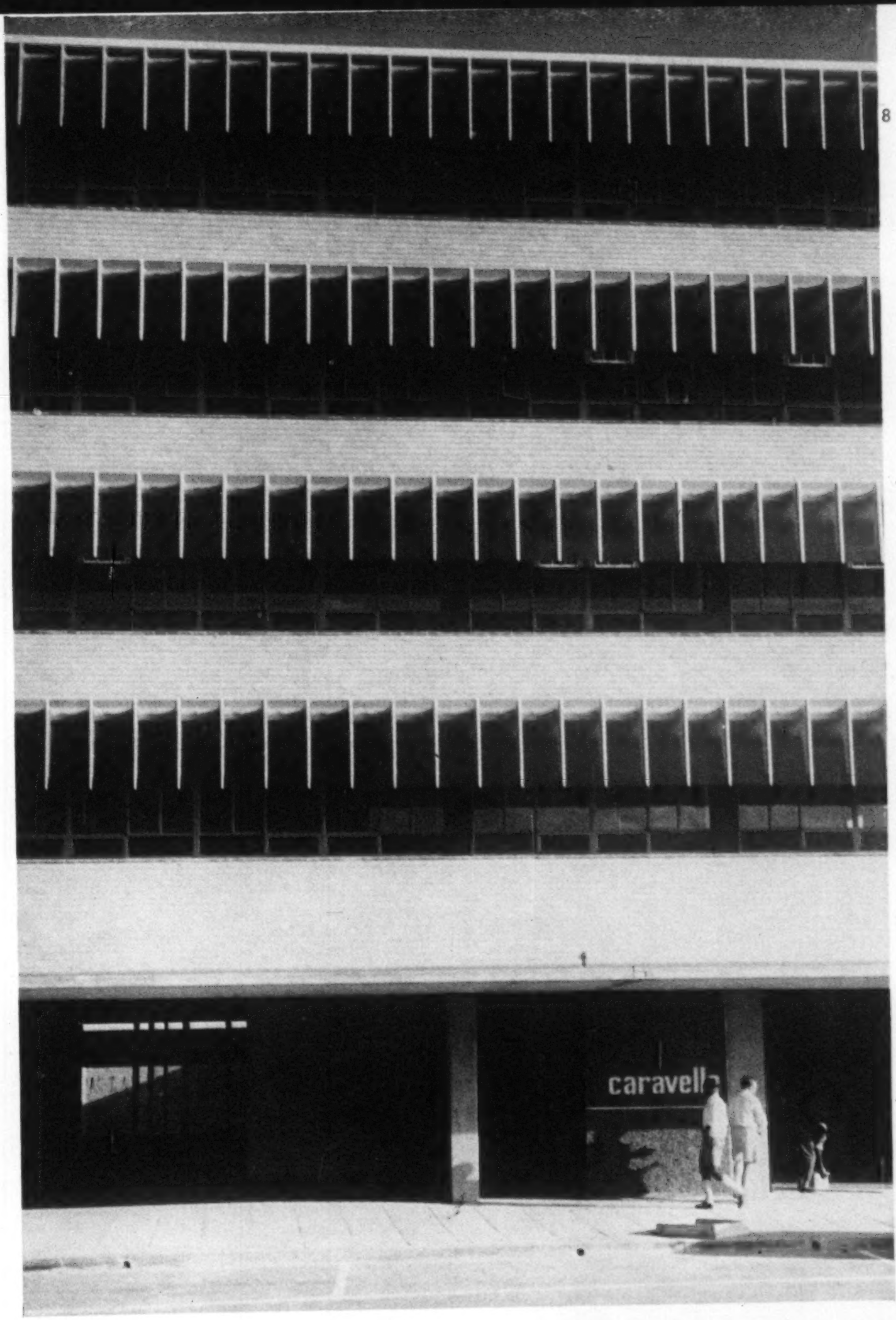


7

6 and 7, municipal library at Lusaka (architects, Rinaldi, MacDonald and Harvey). The building was still unfinished when these photographs were taken: (above), the entrance side showing hall on left and the main first-floor reading-room on right; 6, detail of the link, with a patterned concrete grille, between the main library and the hall. Construction is a reinforced concrete frame with precast slab walling above and narrow brick walling, pierced as shown in the detail, below.

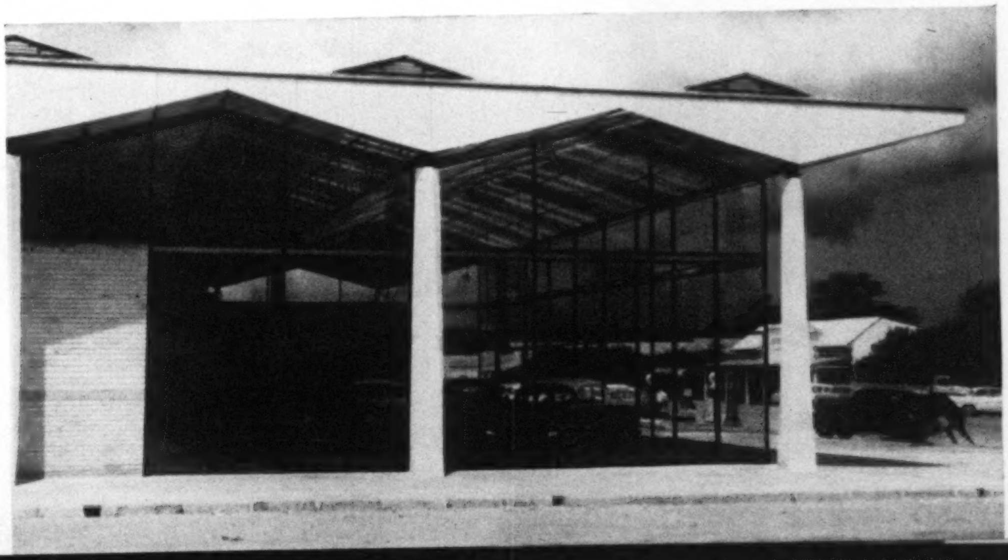


6

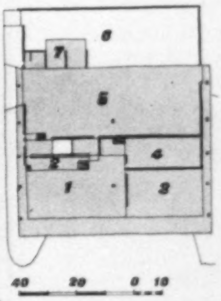


8

8, office building (Caravelle House) at Ndola, with bookshop and restaurant on the ground floor (architects, Gluckman, De Beer and Peters; supervising architect, Julian Elliott). The four floors of offices face north-west and are protected from the sun by a continuous projecting fascia of heat-absorbing glass, subdivided by aluminium frames and cantilevered from the face of the wall on aluminium brackets. Horizontal louvres allow heated air to escape up the face of the building, and also allow windows to be open when it is raining. Walling between the windows is in a grey terrazzo brick.

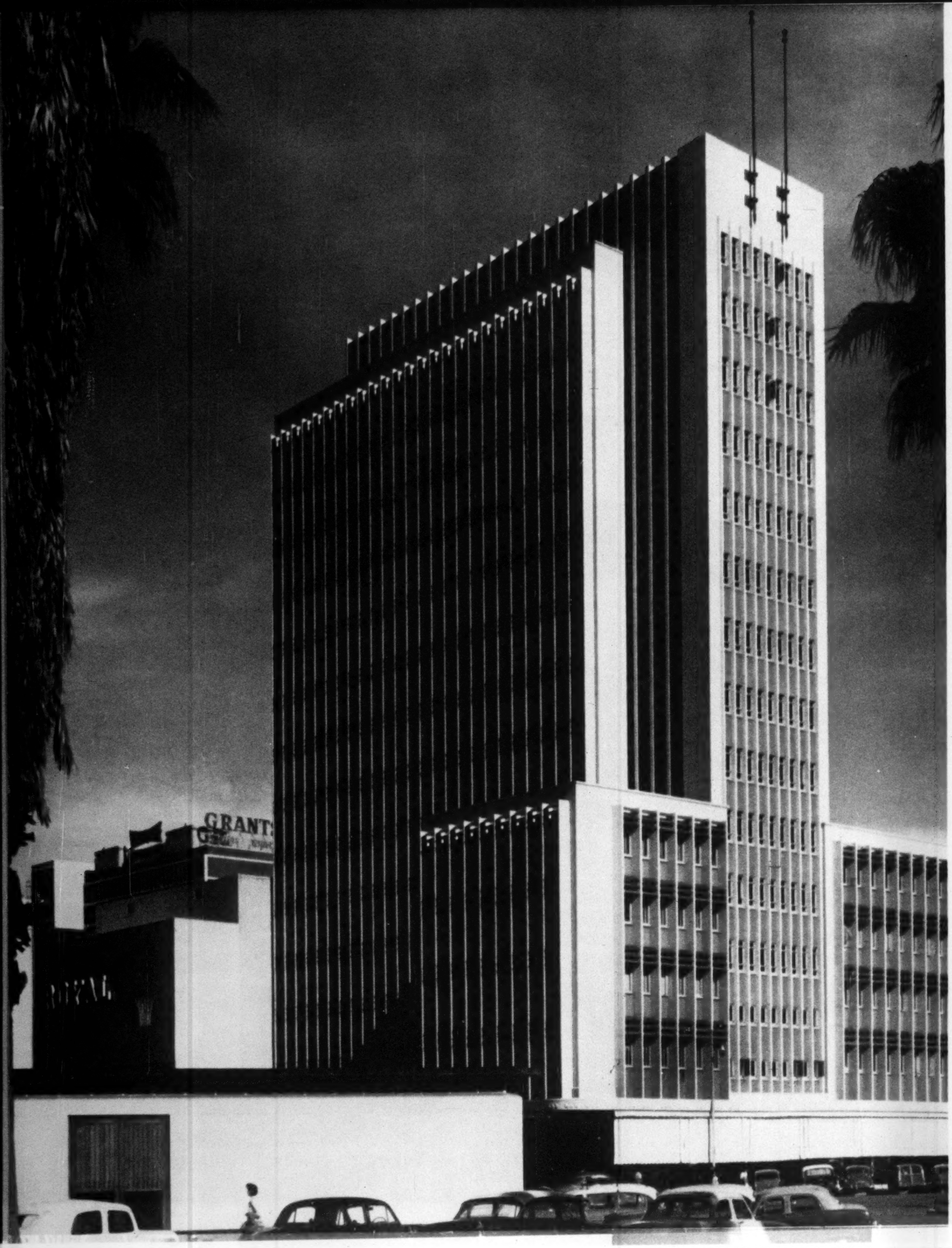


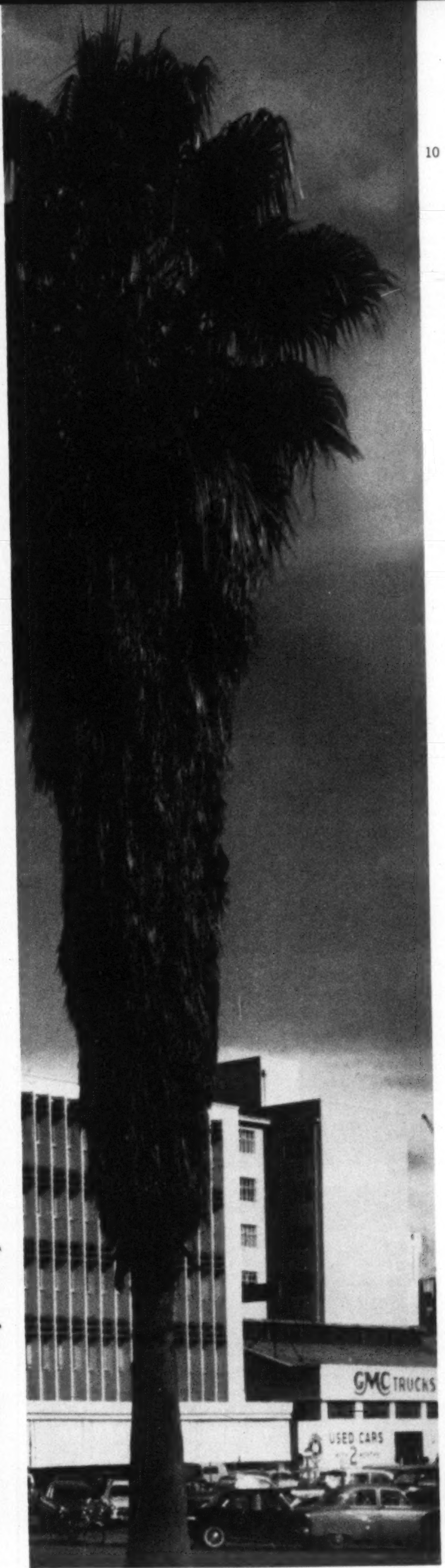
9, garage at Broken Hill (architect, Julian Elliott; assistant in charge, Neil Grobbelaar; engineer, Ove Arup and Partners). Showrooms, spare-part store and workshops are planned round a central administrative core—see plan below—with service core beneath. The tubular steel roof is a spine-girder with balanced cantilevers supported on shaped concrete columns and forming a parasol independent of internal partitions, allowing flexibility of sub-division. The roof is covered with corrugated iron, with translucent sheets designed to equalize the intensity of light in the showroom with that outside and so avoid reflections in the glass wall. The ceiling is expanded metal, through which the light passes and the underside of the roof is partly seen.



key
1, showroom.
2, office.
3, outdoor display.
4, sports.
5, workshop.
6, yard.
7, service bay.

9

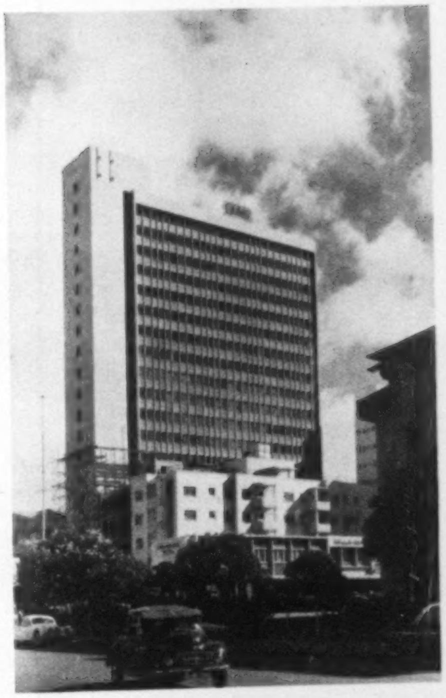

GRANTS



SOUTHERN RHODESIA

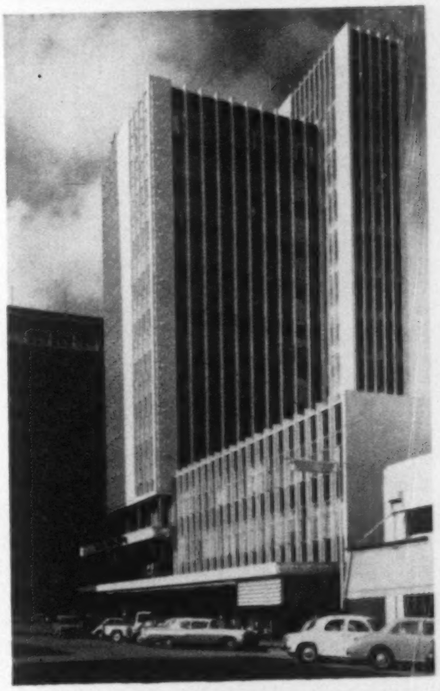
10

10 (left), office building (Robinson House) in the centre of Salisbury (architects, Feit and Meyers, in association with Toung, Morgenstern and Morgenstern of Johannesburg). The ground floor has shops on the two street frontages and the basement a car park. The main tower of fourteen office floors has north-south aspect; the lower wing at right angles has four office floors. Planning is on a 4ft. module. Construction is reinforced concrete with flat slab floors. The north and west façades have terrazzo fins and spandrel panels and all windows are protected from the sun by steel horizontal louvres.



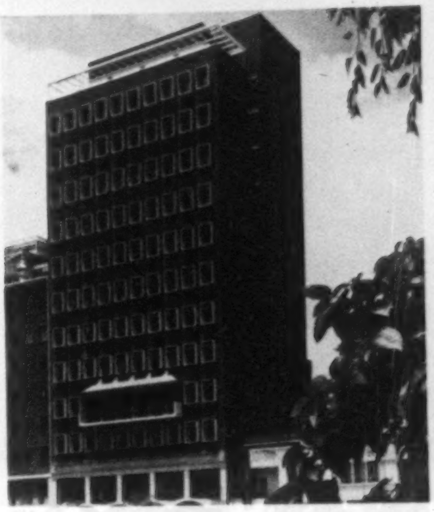
11

11, Ambassador Hotel, Salisbury (architect, Albert Ruddiman): a 20-storey extension of the old hotel, which can be seen in the foreground of the photograph and will later be demolished and replaced. The five lower floors only of the present extension are used for hotel purposes, the remainder being Government offices. Construction is reinforced concrete.



12

12, building society offices, Salisbury (architects, Feit and Meyers, in association with Toung, Morgenstern and Morgenstern of Johannesburg). The ground floor has a banking-hall and shops. The upper floors (except for the tenth, where the society has its executive office) are planned for separate letting. The main tower block of eleven floors faces north and south. The plan is based on a 4ft. module. The main façades have brushed terrazzo fins, steel windows and pressed steel spandrel panels, with a sculptured reconstructed stone facing to the tower. The shop fronts and banking hall are finished in granite and bronze.

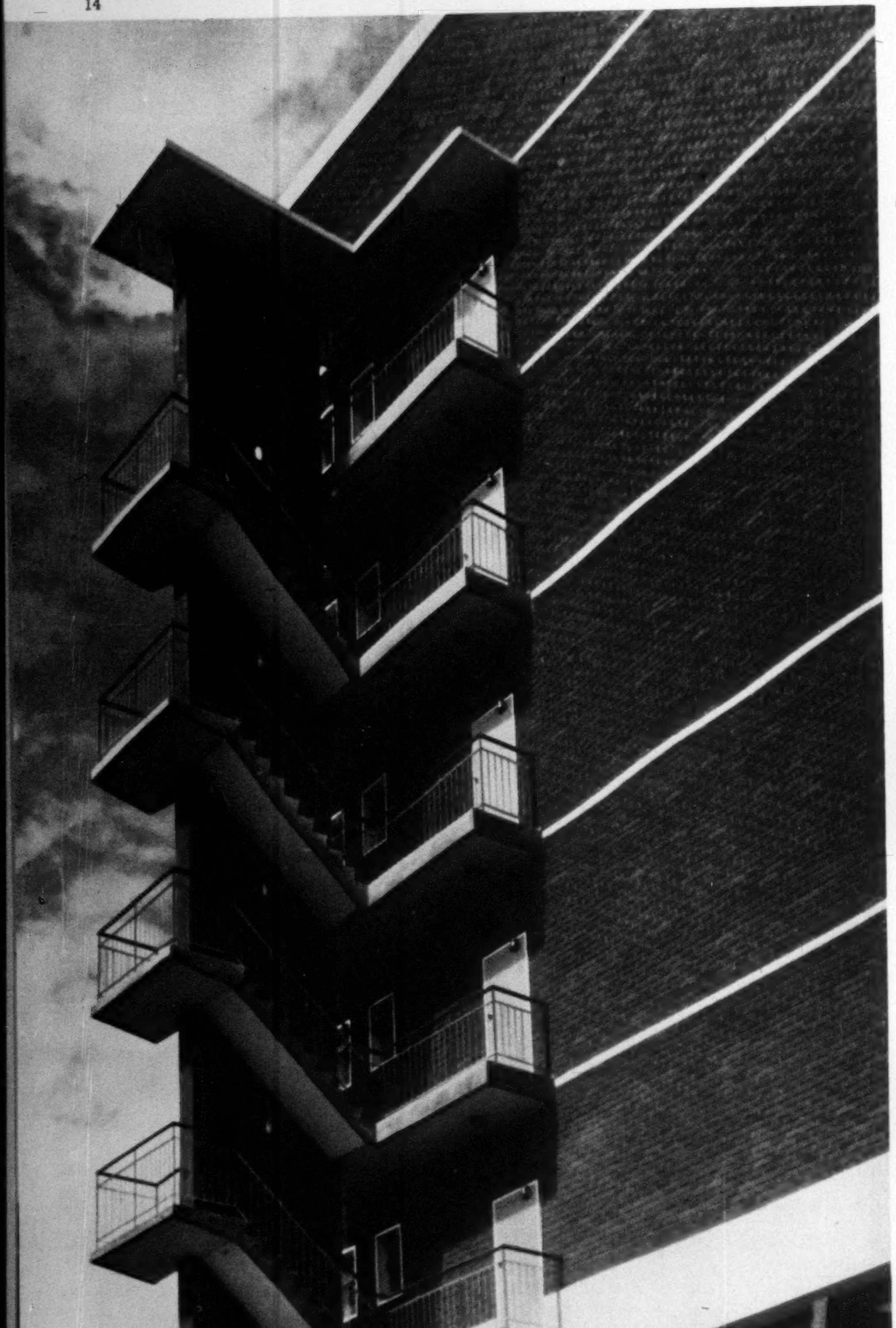


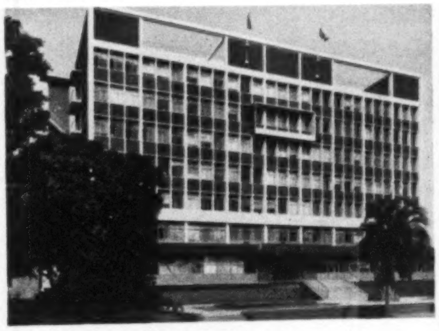
13

13, office building (Trustee House), Salisbury, partly for an investment and property company, partly for letting (architects, John Gauldie and Partners). The ground floor has shops and parking space. The tower block faces north with a view over a public park. Cladding is brick. Boxed screens protect windows from the sun. All office accommodation is air-conditioned.

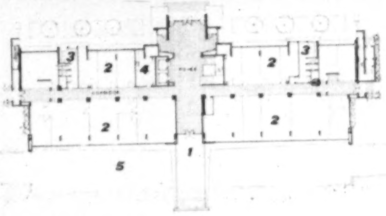
SOUTHERN RHODESIA

14





15

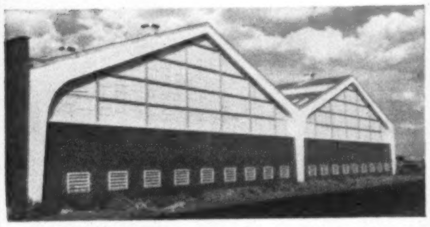


key 1, bridge. 2, offices. 3, lavatories. 4, messangers. 5, ramp to basement.

14 and 15, headquarter offices for Rhodesia Railways, Bulawayo (railway architect, H. Billiard; assistant architect, C. E. Plews): in Metcalfe Square, overlooking the Park. It is the first stage of a much larger scheme. A basement car-park is reached by a ramp, which the main entrance bridges over—see 15 and plan above. Above are seven floors cf offices and a top floor with motor-rooms, etc., on which a cafeteria will be added later. Construction is a reinforced concrete frame with brick infilling. 14 is a detail of the external stairs on the end walls, which face east and west.

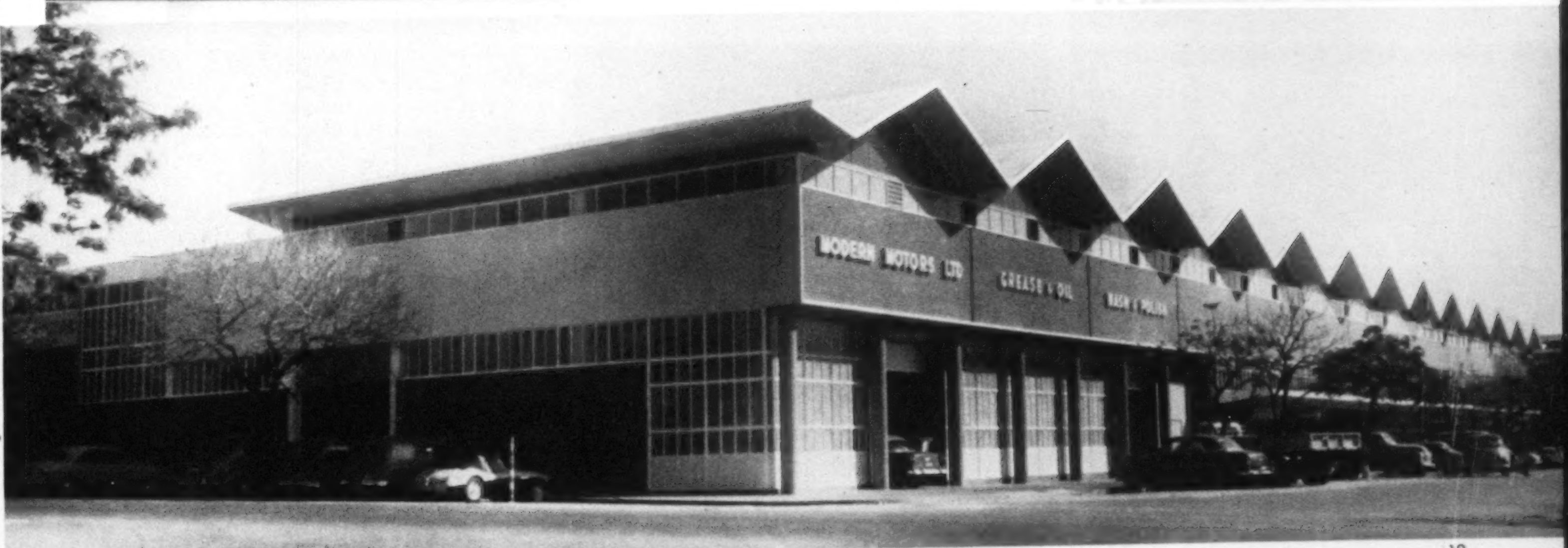
16

16 (above), flats at Salisbury (architects, Rinaldi, Macdonald and Harvey): a group of six identical blocks, laid out in parallel formation, on the fringe of the central business area. The ground floor of each block is occupied by garages.



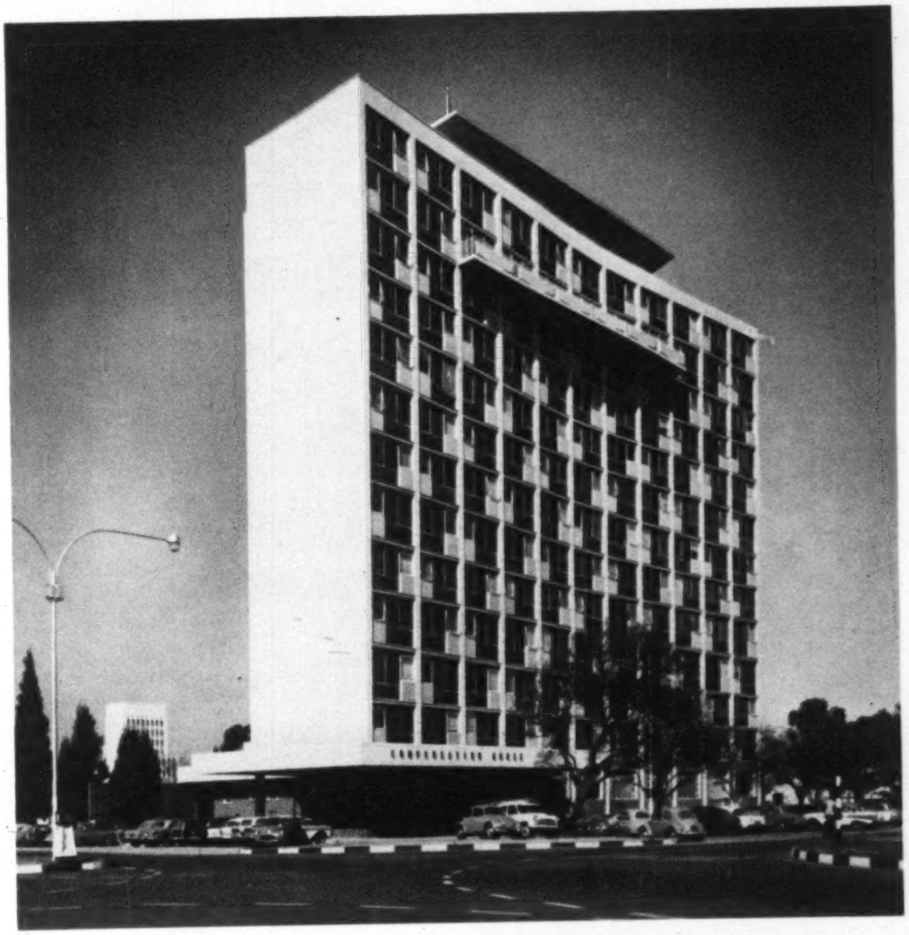
17

17 (above), factory at Bulawayo, producing paper bags, containers, waxed paper, etc. (architects, Rinaldi, Macdonald and Harvey): designed for maximum flexibility of plant and layout. The photograph shows the south elevation of the main production hall, constructed with portal frames in concrete, filled with brick panel walls and glazing.

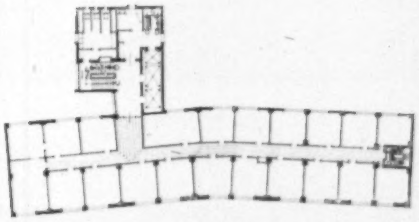


18

18 (above) car showroom and garage, Bulawayo (architects, Berlowitz and Furmanovsky; engineers, Ove Arup and Partners). The building occupies a whole block of Jameson Street, and contains showroom, spares department, used car showroom, battery shop, stores, workshop, service-line and filling station and offices. It is one of the largest of its kind in Africa. To meet the need for minimum changes in floor level, ramps take up a 6ft. fall in the site and mezzanine floors are introduced at the lower end. The photograph shows, from left to right, workshop entrance, ramp entrance to upper-level car-store, and service-line entrance and exit. Construction is reinforced concrete with brick panel-walls on the upper floor and stressed-skin roof in steel.

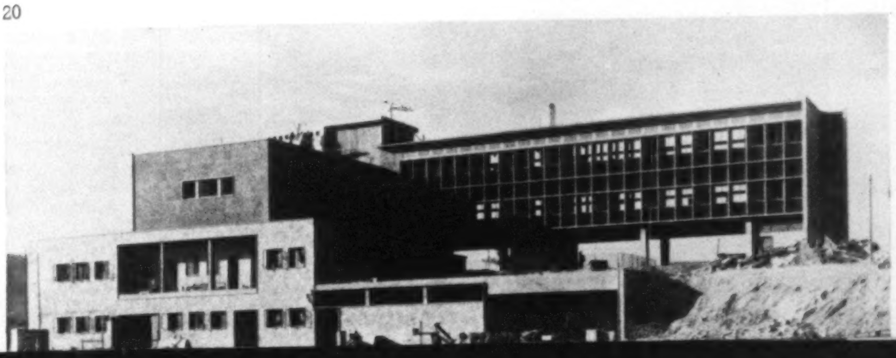


19



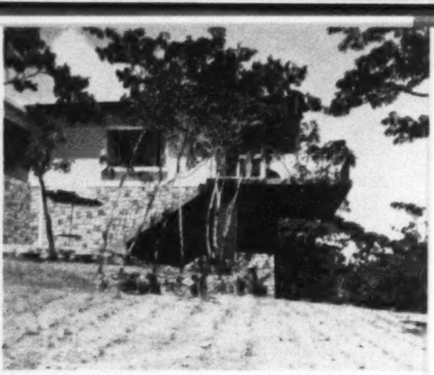
19, office building (Compensation House), Salisbury, for the Workmen's Insurance Fund (architects, Driver-Jowitt and Lincoln): a semi-government project, forming the first part of an official centre straddling the main street of Salisbury. The curved main block (see plan above) is orientated to avoid direct sunlight. The covered entrance leads to an industrial court on the ground floor, with offices above which include those of the Federal Prime Minister; also the Cabinet room. Window façades have yellow-bronze metal panels and blue mosaic, and steel windows with dark-tinted glass. Other façades are mosaic and terrazzo.

20

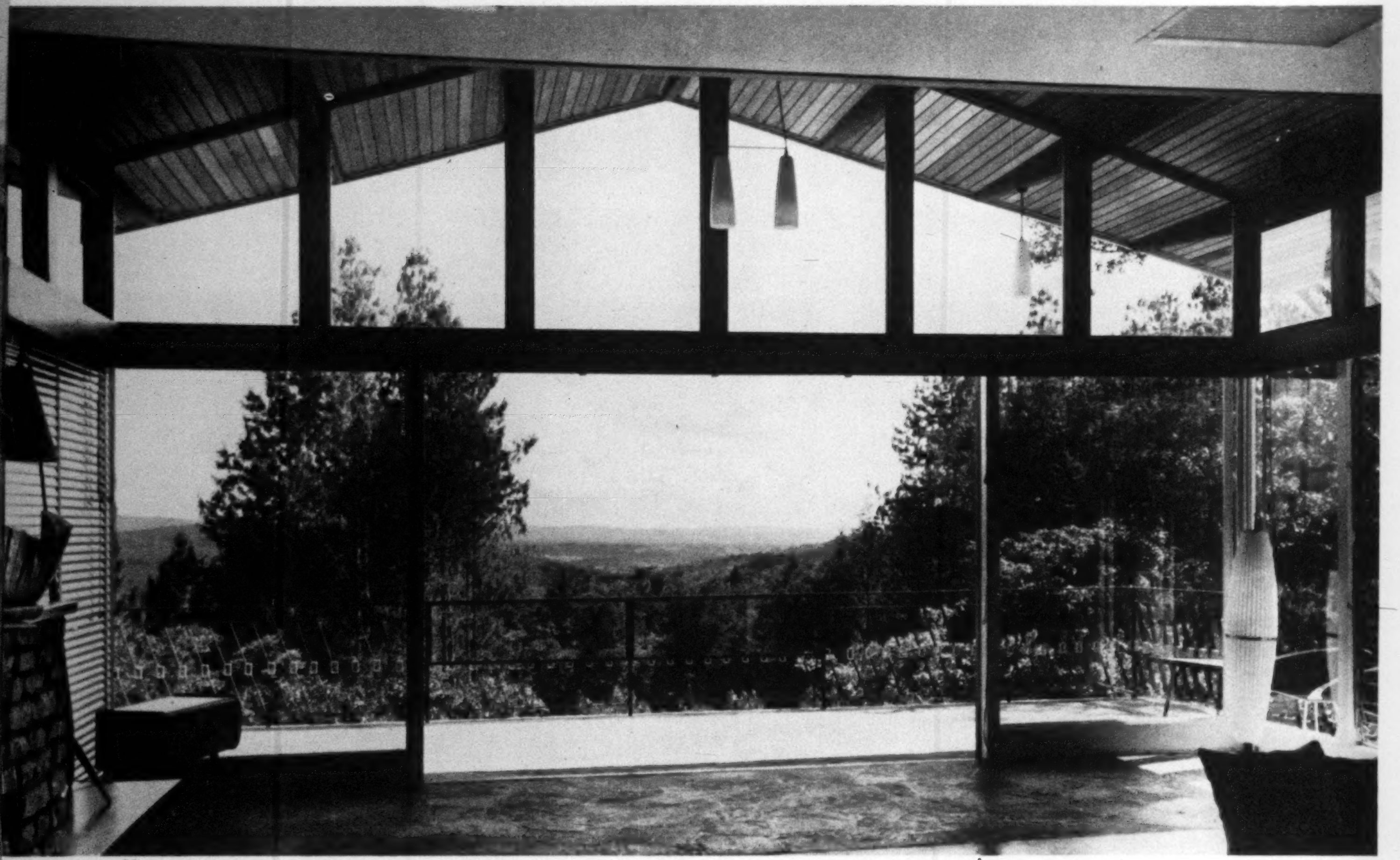


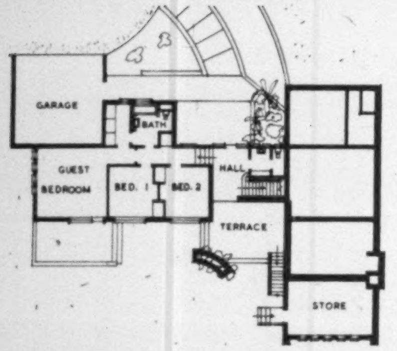
20, control and office building of the Kariba Hydro-Electric scheme, a Federal project on the Zambesi river (architect, H. L. Ford; engineers, Alexander Gibb, Coyne and Sogei). The building, shown here from the north-east, contains the main control room and the offices of the Federal Power Board, which include a demonstration room for film shows, etc., and an observation room cantilevered over the Kariba gorge. The reinforced concrete frame has walling of precast slabs and local stone.

SOUTHERN RHODESIA

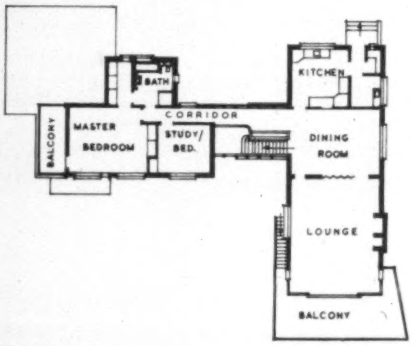

21

21 and 22, house at Salisbury (architects, A. Lloyd Spencer and Partners), built on the top of a small but steep hill, with a cantilevered balcony designed to make the most of beautiful views over the Unwinisidale Valley. The main living-room has sliding windows, seen in 22, opening on to the balcony. The upper floor of the bedroom wing (see plans below left) opens off a gallery over the living-room; the lower floor is reached up a small flight of steps from the entrance-hall.

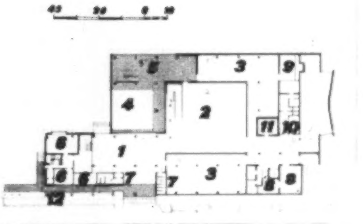

22


GARAGE
BATH
GUEST BEDROOM
BED. 1
BED. 2
HALL
TERRACE
STORE

ground floor plan, house at Salisbury


BATH
CORRIDOR
KITCHEN
BALCONY
MASTER BEDROOM
STUDY/BED.
DINING ROOM
LOUNGE
BALCONY

first floor plan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ground floor plan, Rhodes National Gallery

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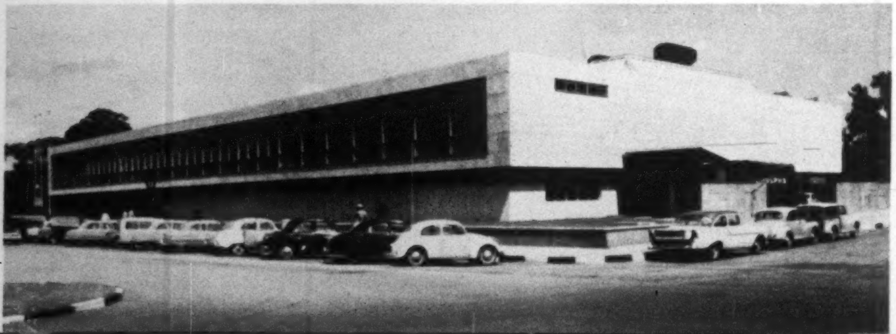
23



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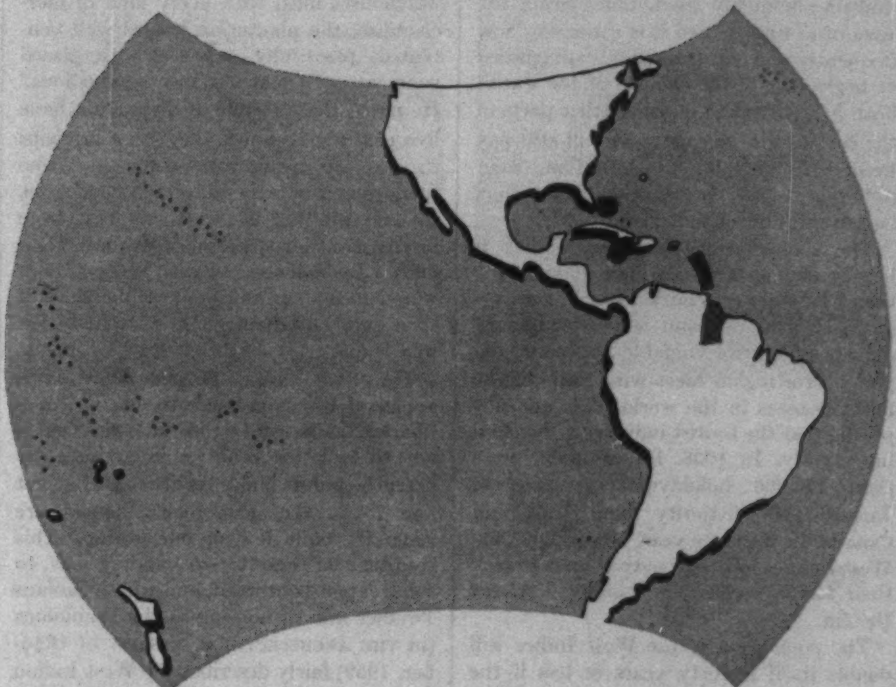
Wilfred Woodhouse



THE CARIBBEAN

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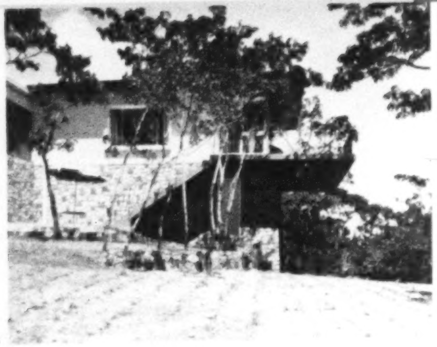
The people are chiefly of African, East Indian and European descent; with several thousand Chinese in Trinidad and Jamaica. The Africans are directly descended from the slaves brought from the Guinea Coast. Following the abolition of slavery in the early nineteenth century there was a large immigration of indentured labourers from India; their descendants are to be found to-day mostly in Trinidad and in British Guiana.

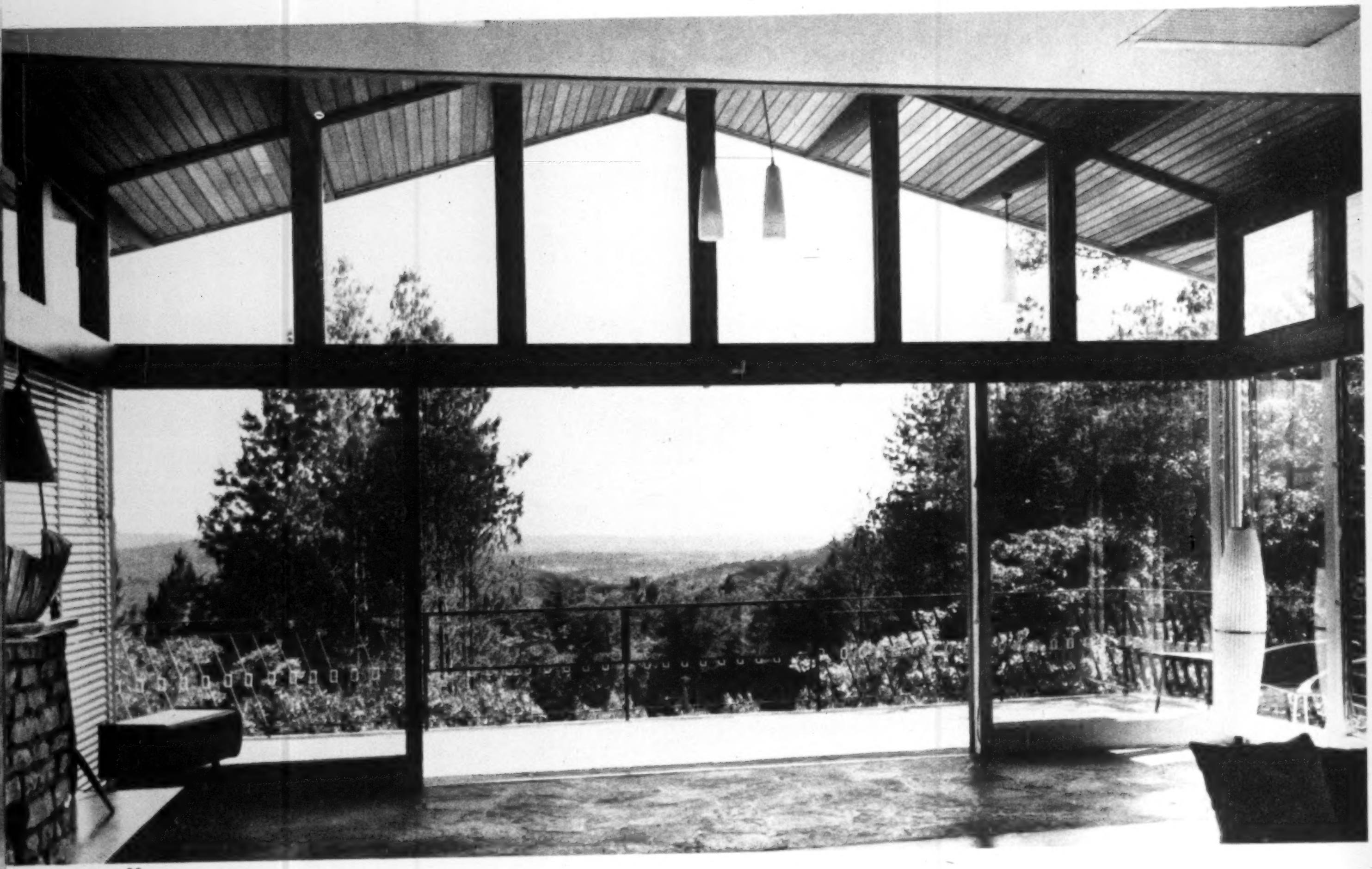
Most of the islands are mountainous and of volcanic origin; Antigua and Barbados, being mainly of coral limestone and low-lying, are the exception. The climate throughout is tropical, but it is tempered by trade winds; temperatures average between 75 deg. and 85 deg. Fahrenheit and the range of rainfall in a year can be as low as 30 in. and as high as 200 in. Hurricanes are not uncommon and there are occasional earthquakes. The hurricane season lasts from June to November, during which period three hurricanes on an average pass over some part of the Caribbean. Risk of serious damage is not very great where buildings are well constructed. A contributory factor to collapse, especially

SOUTHERN RHODESIA



21

21 and 22, house at Salisbury (architects, A. Lloyd Spencer and Partners), built on the top of a small but steep hill, with a cantilevered balcony designed to make the most of beautiful views over the Umrwisidale Valley. The main living-room has sliding windows, seen in 22, opening on to the balcony. The upper floor of the bedroom wing (see plans below left) opens off a gallery over the living-room; the lower floor is reached up a small flight of steps from the entrance-hall.



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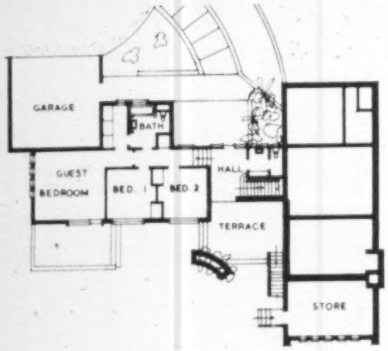
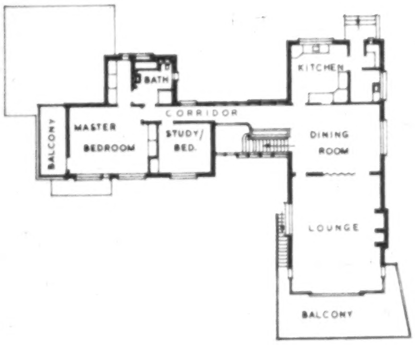


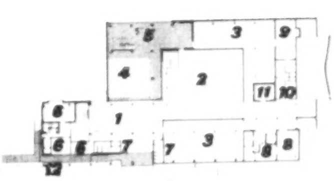
GARAGE
BATH
GUEST BEDROOM
BED. 1
BED. 2
HALL
TERRACE
STORE

ground floor plan, house at Salisbury



BALCONY
MASTER BEDROOM
BATH
CORRIDOR
STUDY/ BED.
KITCHEN
DINING ROOM
LOUNGE
BALCONY

first floor plan



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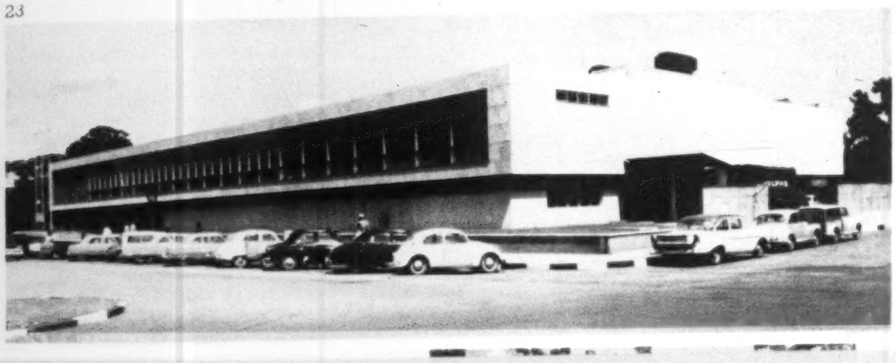

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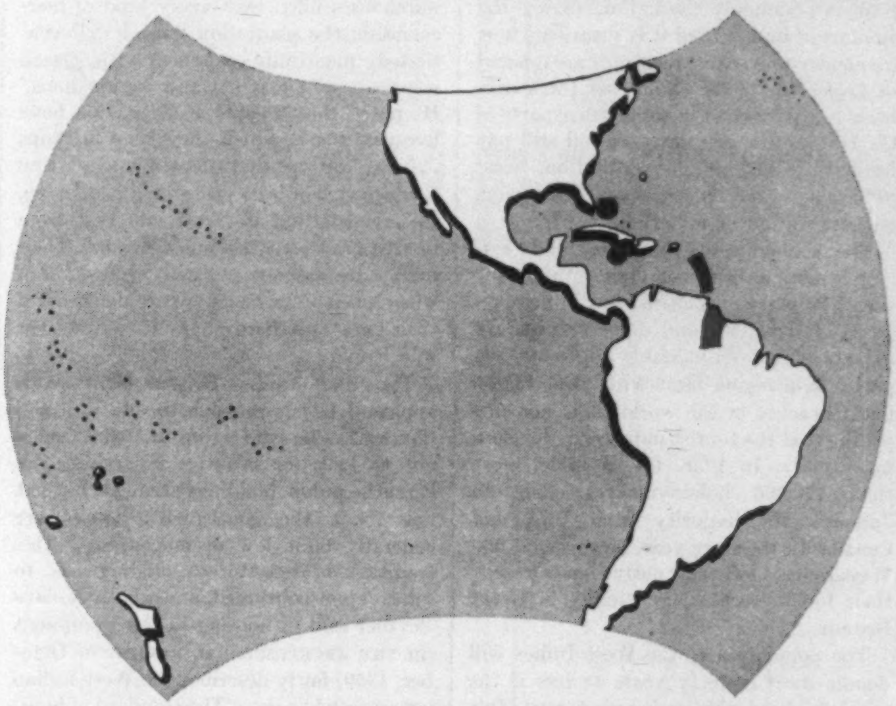

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The population of the West Indies will double itself in forty years or less if the present rate of increase is maintained. This places a severe strain on the slender resources, both from home or abroad, which are available to the region. The first call on these resources is for the general improvement of the economy, but this means that social services, including much-needed housing and health services, must come second. The rate of new house-building is far behind what is needed to remedy overcrowding and obsolescence and to provide for the increasing population. Barbados provides a good illustration of the difficulties. Here the population increases at two per cent per annum. The most optimistic estimate of the rise in the national income during the next generation is that the rate will not exceed one-half per cent per annum. Here is a country with a permanently limited income and a rapidly rising population. One cannot escape the conclusion that some parts, at least, of the West Indies are over-populated. While new harbours, industrial development, education, health and housing improvements are very desirable, nothing Governments can do is comparable in importance with success in arresting the increase of the population.

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JAMAICA

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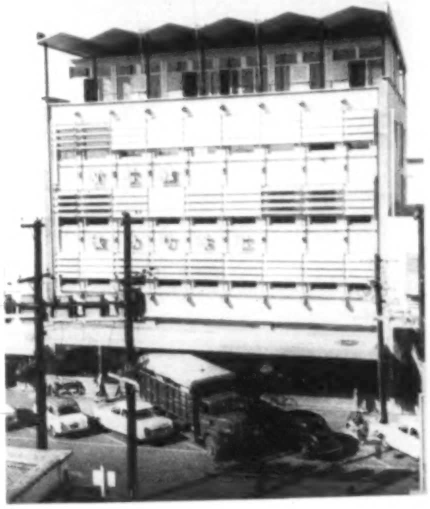

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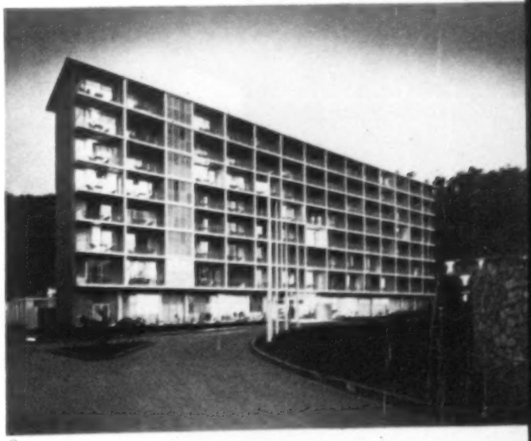

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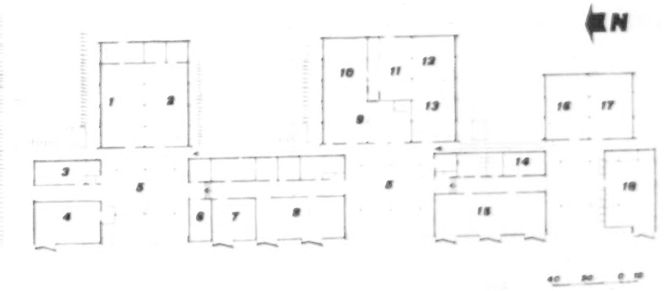

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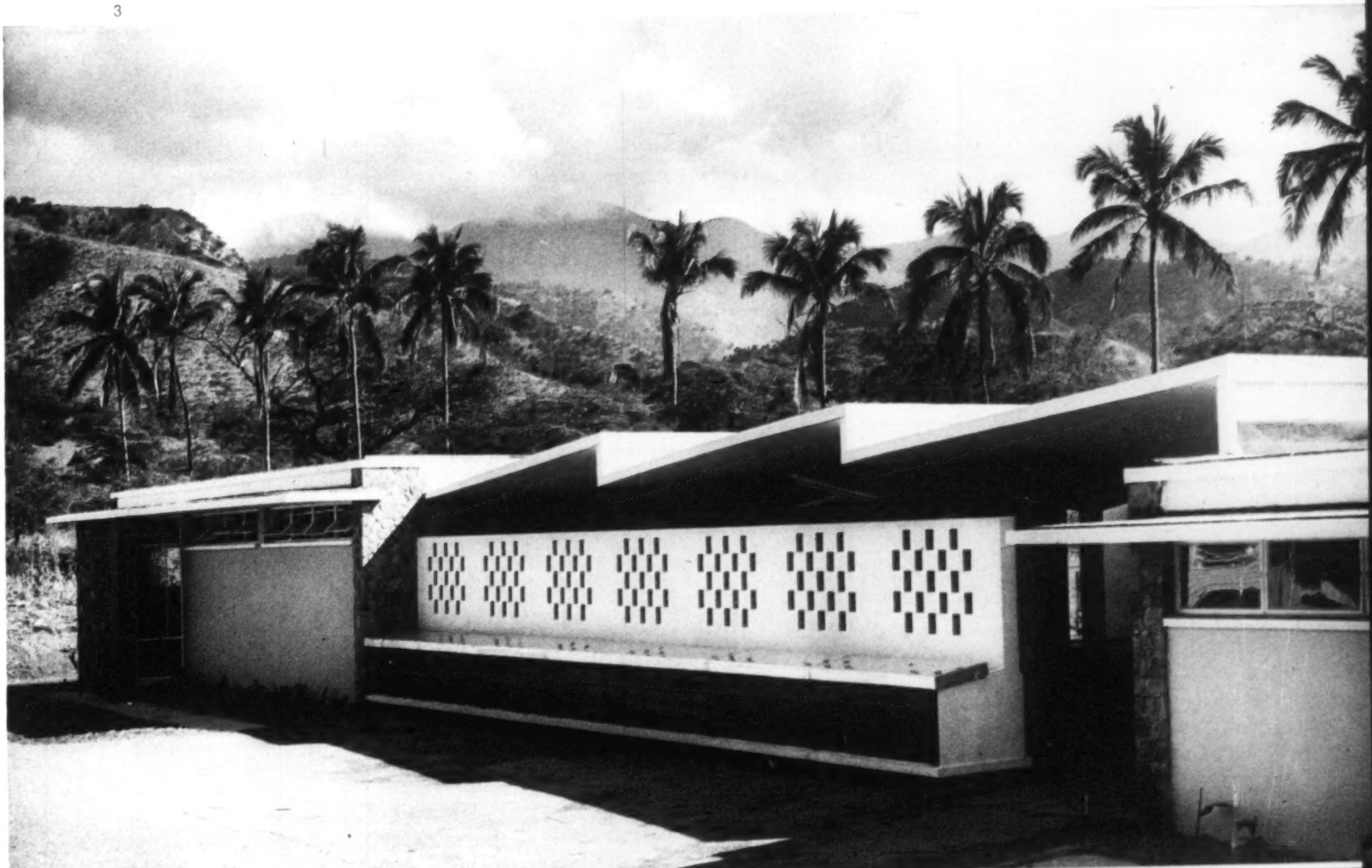

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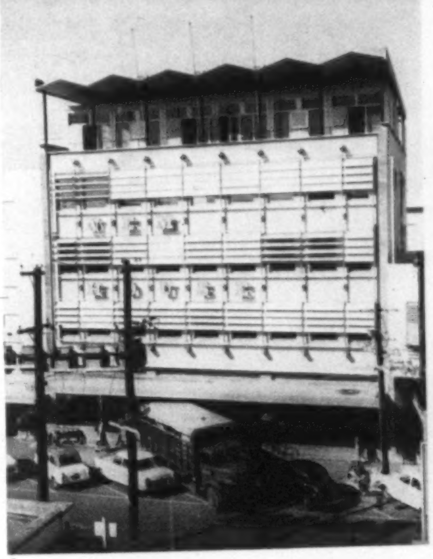

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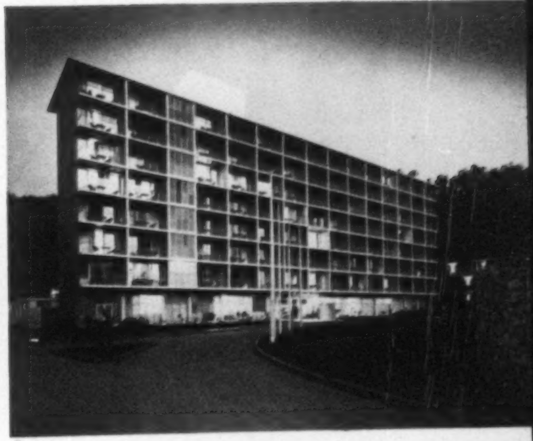

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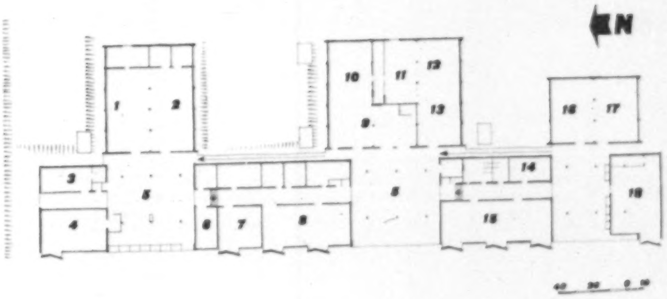

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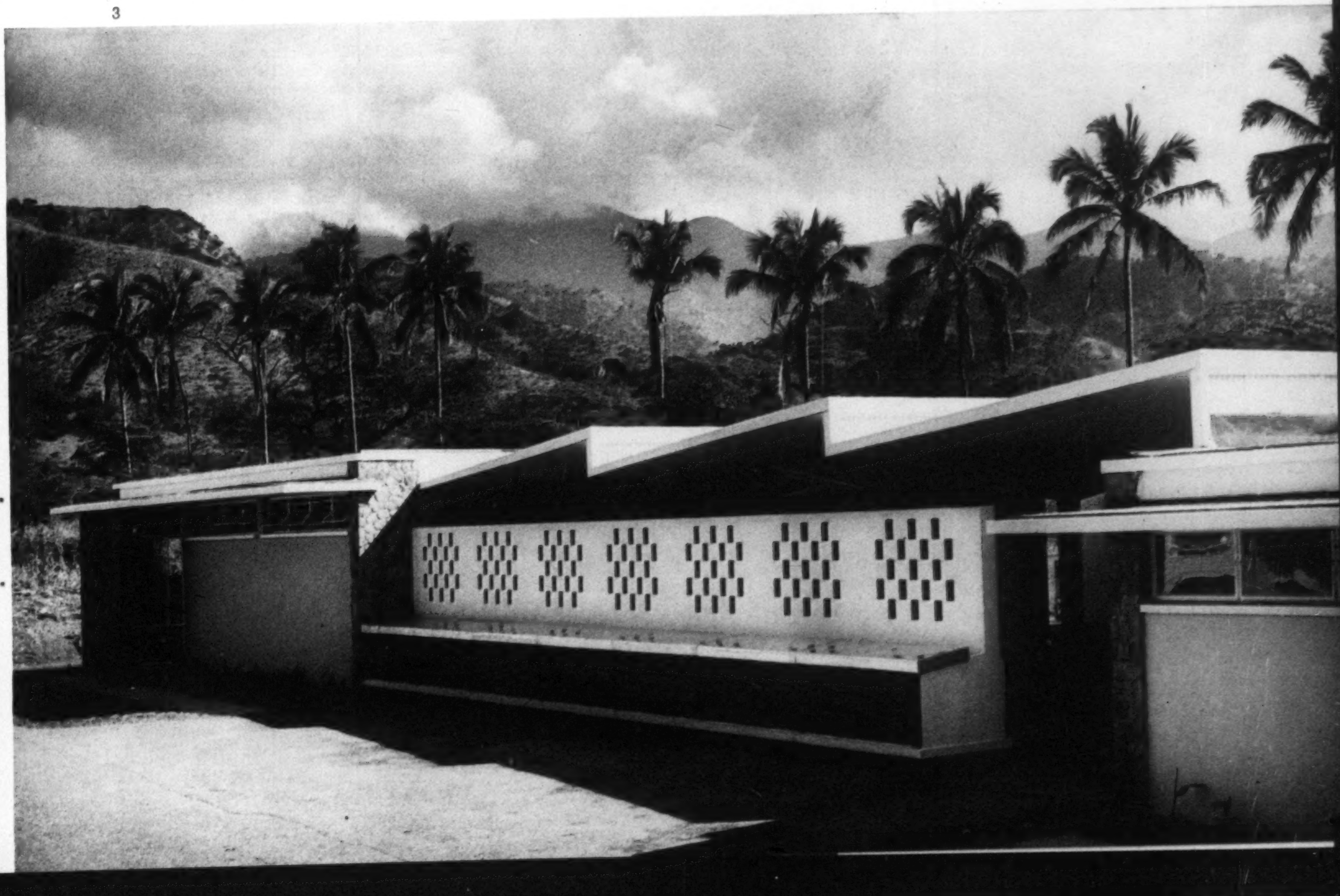

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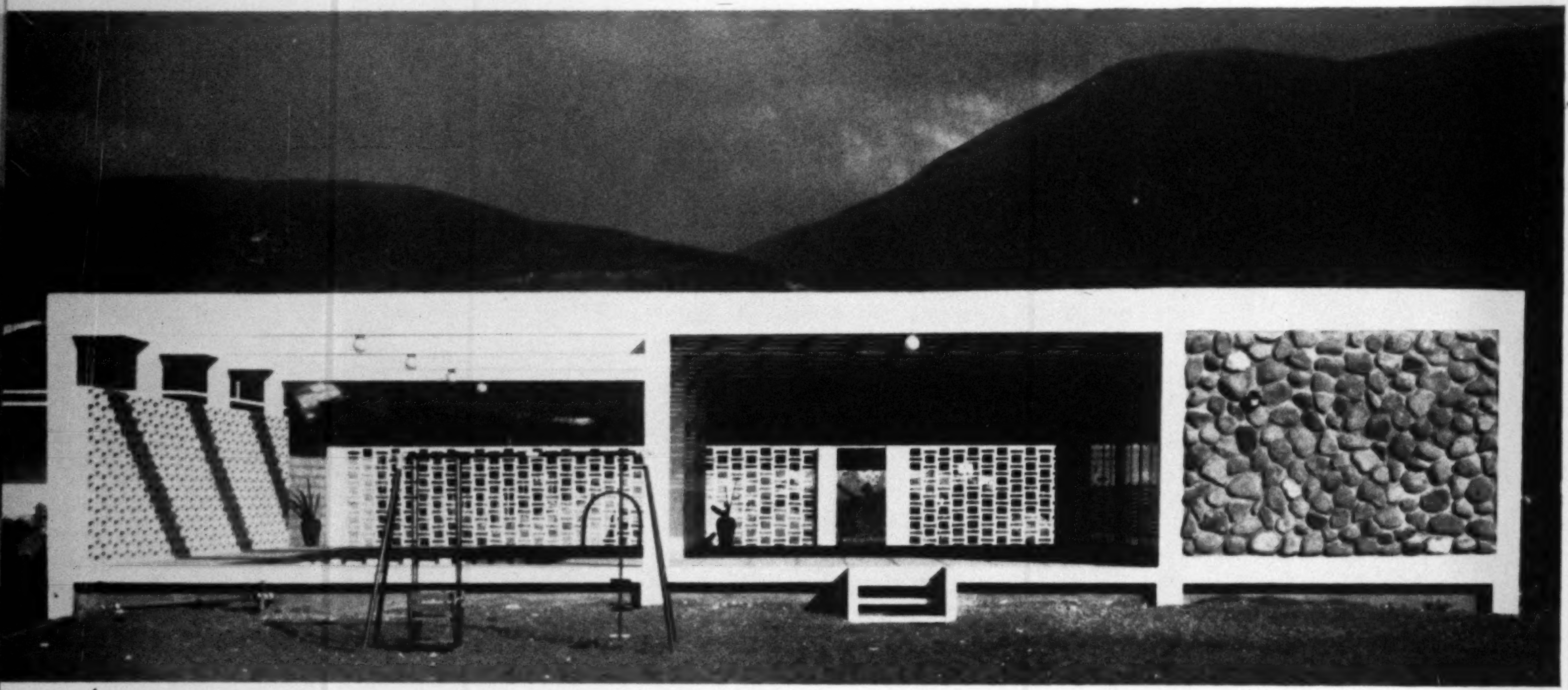

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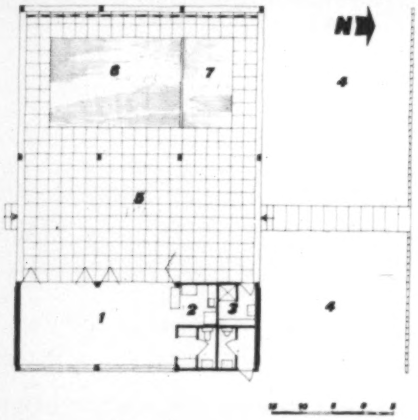
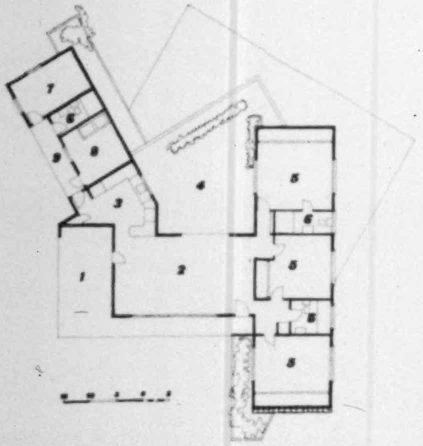


4 (above), beach cottage at Bull Bay (architect, Denis G. M. Chalmers): *for day and occasional night use. The main room, which can be divided in two by a curtain to serve as living and sleeping room, opens on to a covered patio (see plan on left) with swimming pool and children's pool. Construction is reinforced concrete with panels of seastones from the site. The screen-wall seen in the background in the photograph gives privacy from a main road beyond. The ground between screen and cottage is to be planted as a garden.*

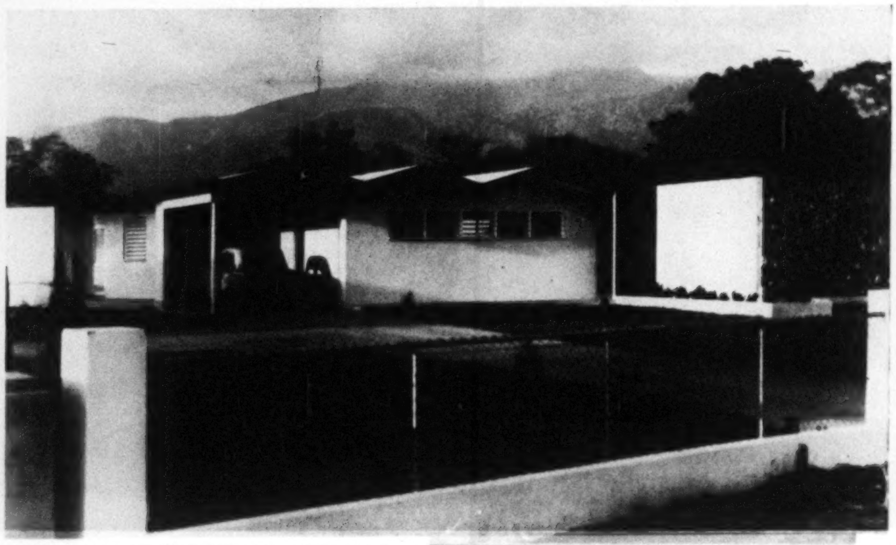
key
1, living and sleeping.
2, kitchen.
3, change.
4, gardens.
5, patio.
6, pool.
7, children's pool.

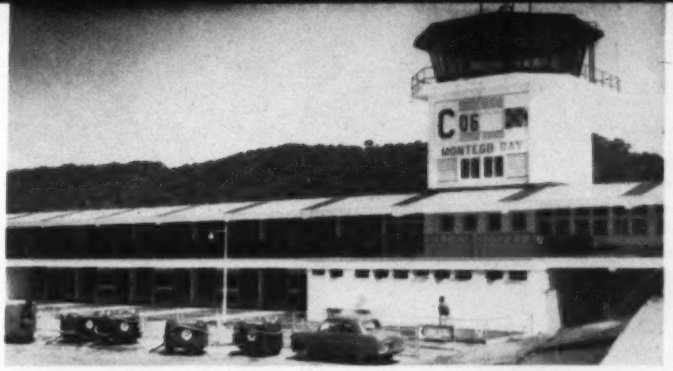
5, (below right), house at St. Andrew (architect, Wilson Chong): *single-storey, planned round a paved terrace—see plan below—with car-port under an extension of the living-room roof. The latter is reinforced concrete, consisting of flat slab and hipped plates. Walls are load-bearing reinforced blocks, plastered. Windows are timber.*



key 1, car port. 2, dining and living. 3, kitchen. 4, patio. 5, bedrooms. 6, bathrooms. 7, maid's room. 8, laundry. 9, walkway.

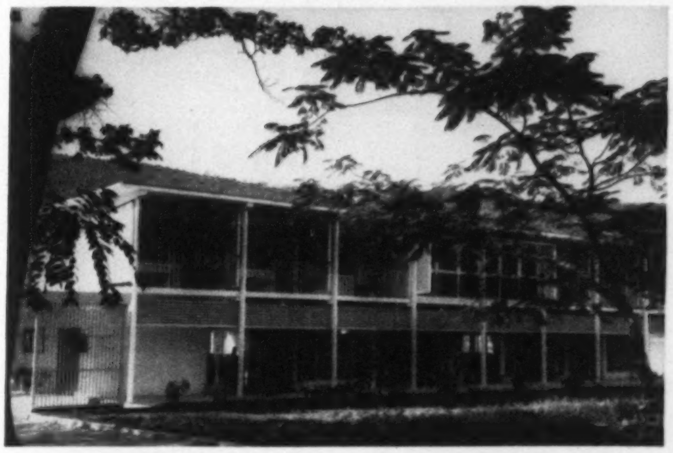
5





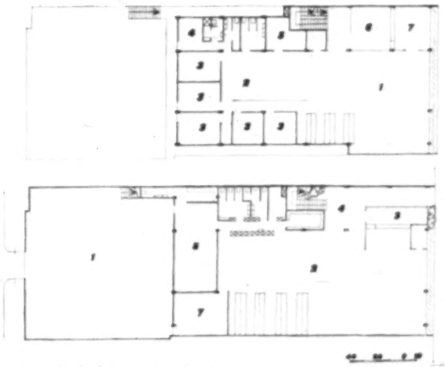
6

6, terminal building, Montego Bay airport (architects, Norman and Dawbarn), designed to allow expansion at either end—one end has already had a restaurant added—and to allow a free flow of air through the concourses. The air-side (shown in the photograph) has two-storey offices; the other side is single-storey. The curved roof, which has a precast concrete frame, oversails both sides to shade the windows. The main structural frame is also precast, with wall panels of local stone or concrete blocks.



7

7, senior common-room, University College of the West Indies (architects, Norman and Dawbarn): the latest addition to the large group of college buildings illustrated in the AR, October, 1953. It provides recreation and dining-rooms for the senior academic staff and, on the first floor, a library and six visitors' bedrooms. It faces north with views to the Blue Mountains. It has a reinforced concrete frame with concrete block walls.



offices at Kingston

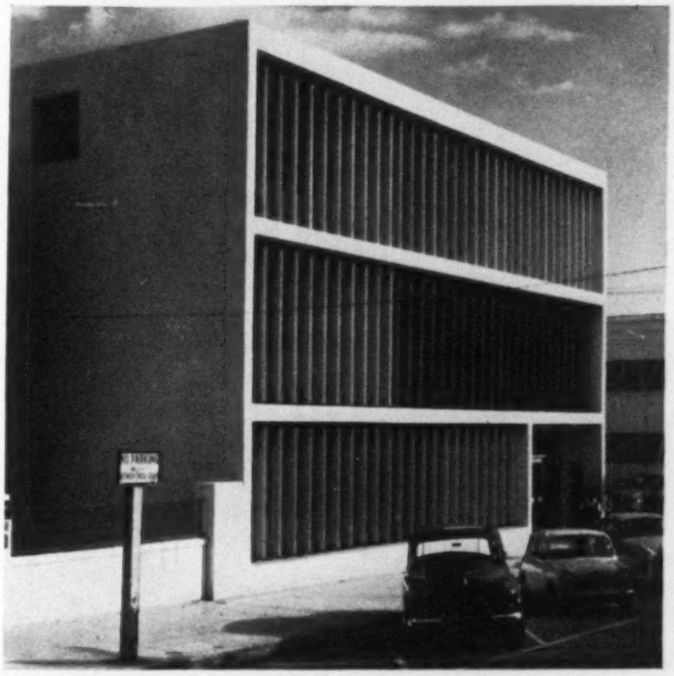
key

ground floor plan

1, car park.
2, general office.
3, public waiting space.
4, lobby.
5, lunch room.

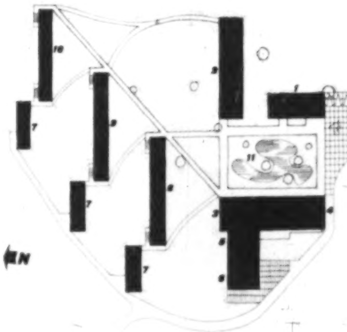
first floor plan

1, general office.
2, secretaries.
3, offices.
4, library.
5, vault.
6, public waiting space.
7, reception.



8

8, offices in the business centre of Kingston (architects, Ashwell, Dunn and Associates). The building (see plans above) contains general office space and the offices of the architects who designed it. The structure is reinforced concrete with reinforced block infill panels and movable louvres protecting the street front. The roof is insulated against sun by 3in. of water contained by an asphalt membrane. The offices are air-conditioned.



site plan of farm school

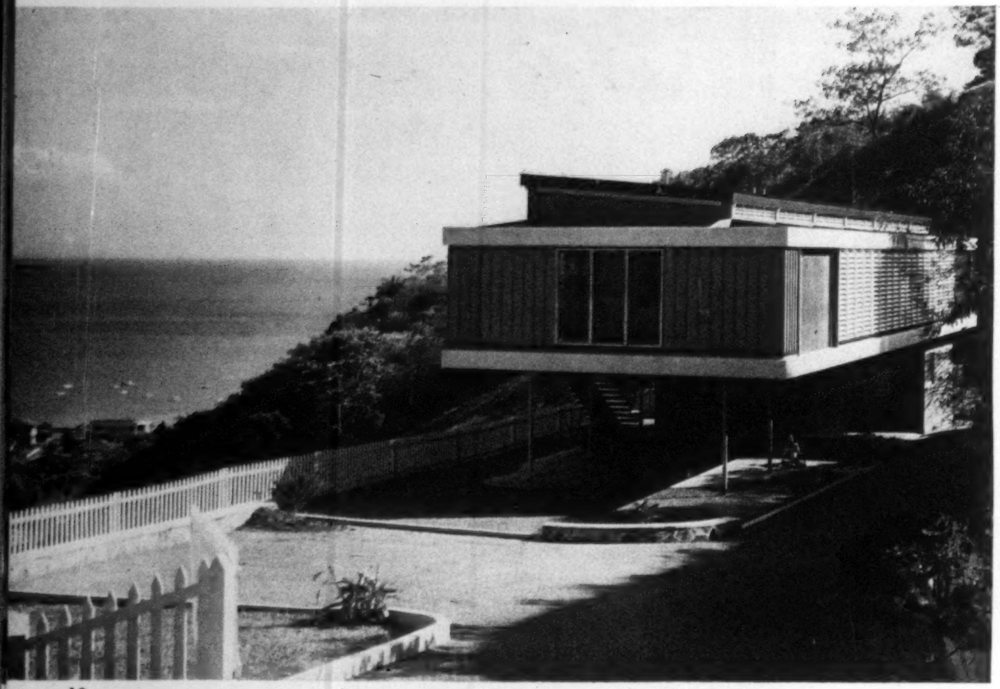
key

1, admin. and library.
2, classrooms and laboratories.
3, dining hall.
4, assembly hall.
5, kitchen.
6, laundry.
7, lavatories and cycle sheds.
8, 9, 10, dormitories.
11, quadrangle.

9

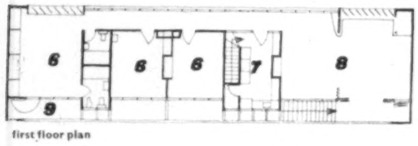
9, Government farm school, between Kingston and Spanish Town (architects, Ashwell, Dunn and Associates): a residential training school for 160 students, on a plateau in the Liguanea Plain. The buildings (laid out in parallel east-west blocks to avoid sun-penetration—see site plan above) are connected by covered ways. The photograph shows the administration and one of the classroom blocks looking eastwards across the garden courtyard. Construction is reinforced concrete with concrete block walls.

6, bathrooms, 7, maid's room, 8, laundry, 9, walkway.

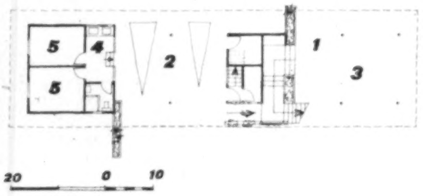


10

10 and 12 (*facing page*), *seaside house overlooking the Gulf of Paria (architect, Anthony C. Lewis), on a steeply sloping site of which only a narrow strip was levelled. The main rooms are on the upper floor (see plans below), raised on steel columns. The superstructure is reinforced concrete, with continuous concrete fascia top and bottom. The landward elevation, 12, facing west, has both vertical and horizontal louvres. The upper roof is a clerestory with fixed louvres for convection. Cladding is plywood with cedar cover-strips. Ground floor walls are brick. 10 shows the approach from the north-west.*



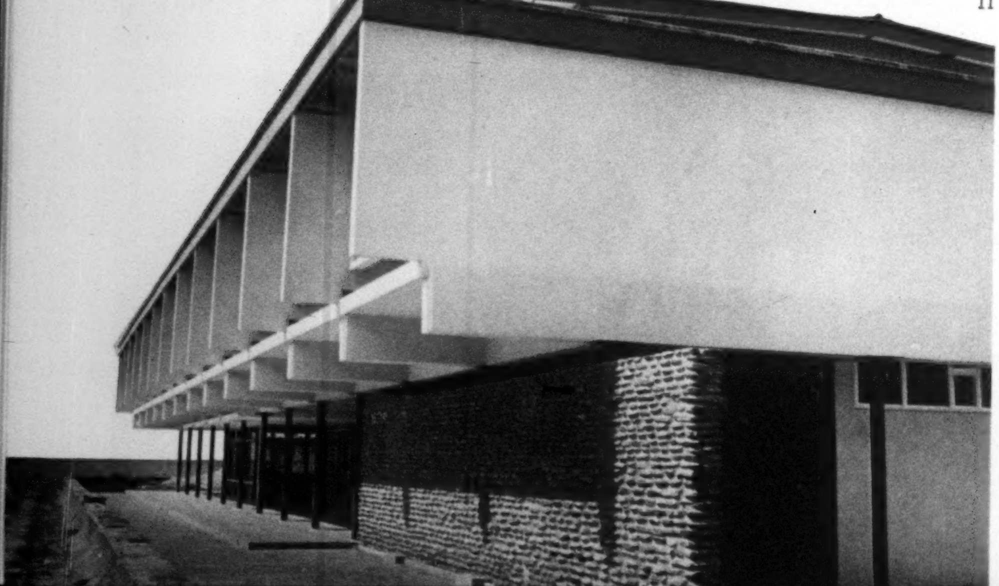
first floor plan



ground floor plan

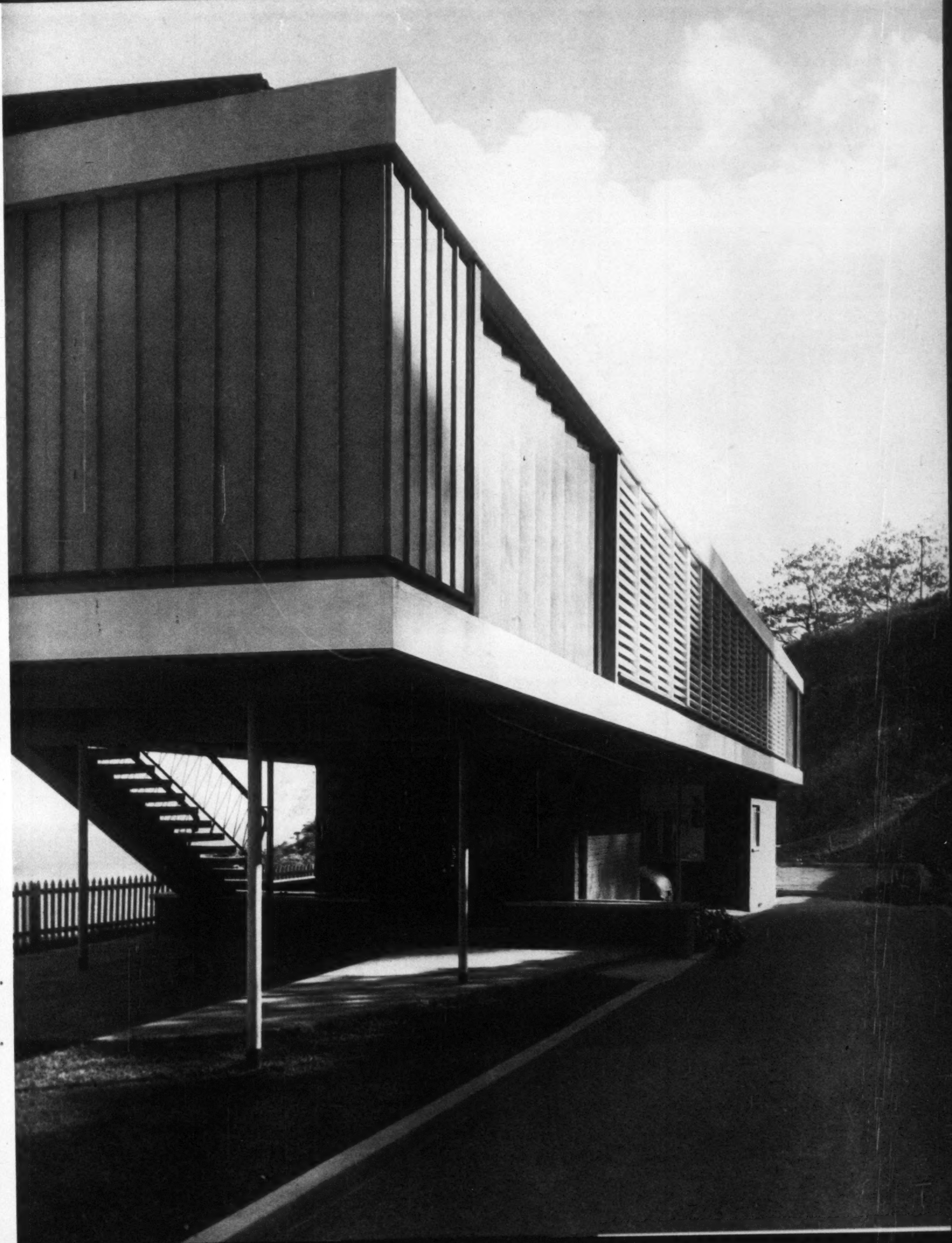
key
1, entry.
2, car port.
3, garden porch.
4, laundry.
5, maid.
6, bedrooms.
7, kitchen.
8, living and dining room.
9, balcony.

12→



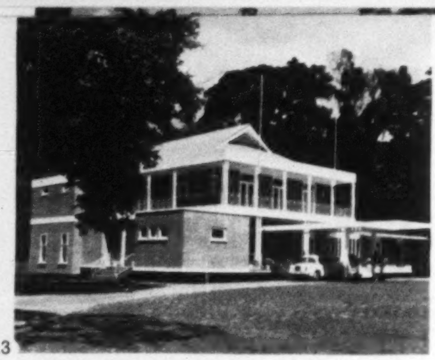
11

11, *Shorelands Hotel, on a promontory overlooking the Gulf of Paria (architect, Anthony C. Lewis). The twelve guest-rooms are in a row on the first floor, each with bathroom and private balcony. The latter have projecting side walls to give greater privacy. The ground floor has informally planned entrance, reception and staircase opening on to a lounge with an open terrace on the south (sea) side. This is used for dining and is partly protected by plate-glass screens. Construction is steel columns with reinforced concrete beams. The low-pitched roof provides clerestory lighting and cross ventilation to the bedrooms over the top of the corridor. The free-standing ground-floor walls are of local stone.*

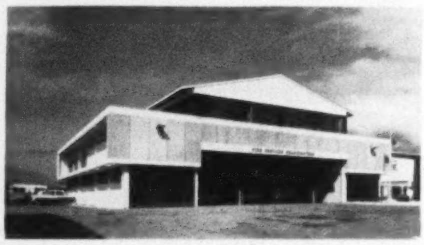


TRINIDAD

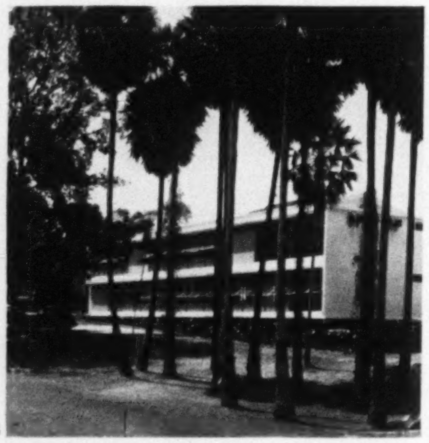
13, *new Government House at St. Ann's, Port-of-Spain (architects, Mence and Moore), required because the old one is now occupied by the Federal Governor-General. The accommodation is that of a large residence with provision for guests (including, on occasion, Royalty) and for large-scale entertaining. Construction is reinforced concrete with pipe columns and walls of concrete bricks.*

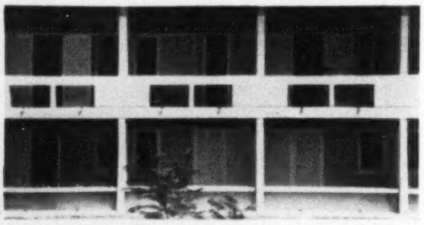

13

14, *fire services headquarters, Port-of-Spain (architects, Mence and Moore), with the usual accommodation for appliances and watch-rooms and dormitories above and in mezzanines at the sides. It has a reinforced concrete frame and timber floors. Anti-glare glass is used either side of the entrance.*


14

15, *office building, Port-of-Spain, for the Cocoa Board (architects, Mence and Moore): a reinforced concrete structure of 20ft. span with a 10ft. cantilever either side. Walls are metal windows and concrete blocks. The roof is timber.*


15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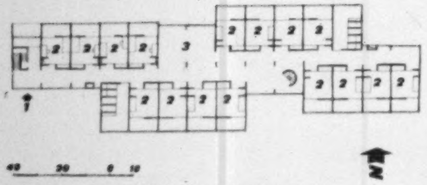
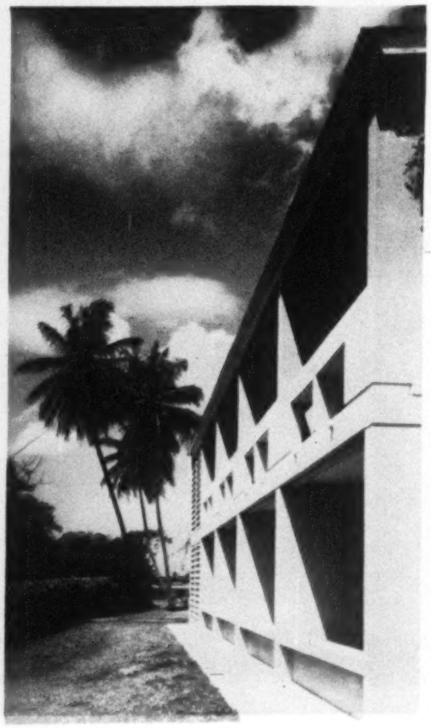


ground floor plan, students' quarters, St. Augustine

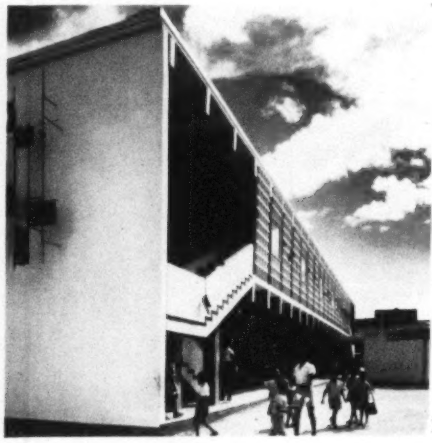
key 1, entrance. 2, students' rooms. 3, dining room.

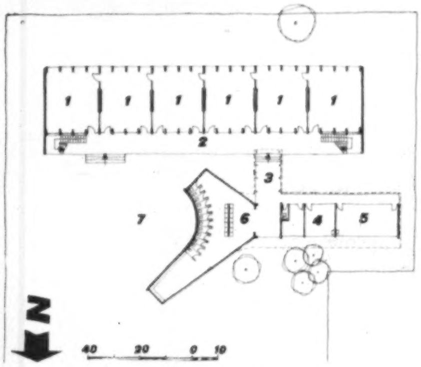
16 and 17, *students' quarters, with dining-room and kitchen, at the Imperial College of Tropical Agriculture, St. Augustine (architect, R. Llewelyn Davies; supervising architect, Colin Laird). The buildings run east-west for protection from the sun but are designed to catch cross-currents of wind, which is mainly easterly. The students' rooms are in two blocks,* 16, *each with sixteen rooms to a floor, arranged in groups of four—see plan above.* 17 *shows the dining-room with open timber grille and louvred doors to provide through ventilation. The structure is reinforced concrete with walls of hollow clay blocks.*


17

18→

18 *(facing page), office building at San Fernando (architects, Mence and Moore) for the Trinidad and Tobago Electricity Commission. The two storeys of offices, which are one room deep, oversail the ground floor, which is extended in the form of a single-storey wing at the back and contains reception and showroom. Construction is a reinforced concrete frame with rough concrete facing slabs in the end wall and a low basement wall of concrete bricks. The staircase window has horizontal metal louvres. The offices are protected by aluminium and timber sunbreakers.*


19



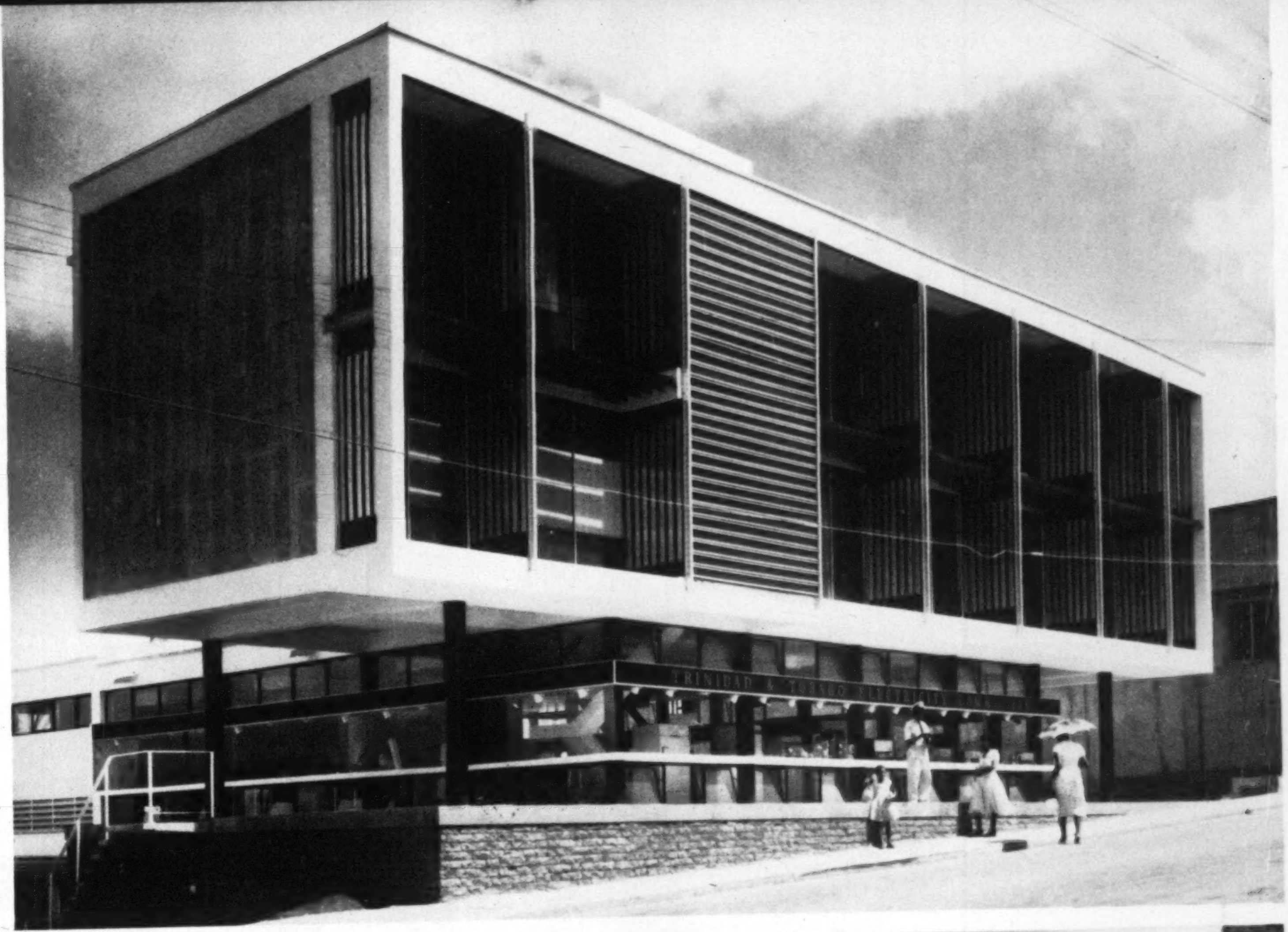
ground floor plan, primary boys' school, Port-of-Spain

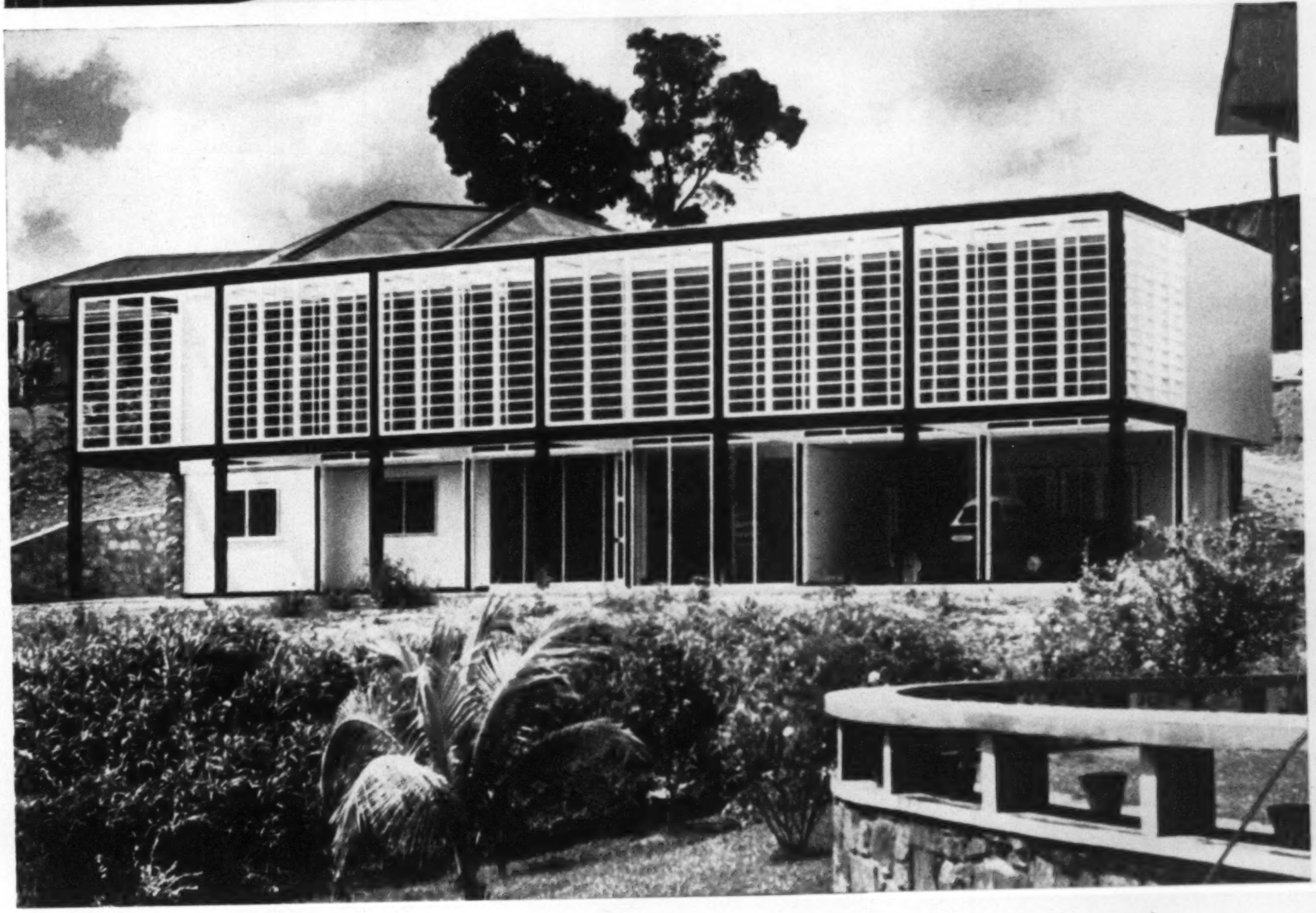
key 1, classrooms. 2, corridor. 3, covered way. 4, head teacher. 5, staff room. 6, lavatories. 7, playground.

19 *(above), boys' primary school, Port-of-Spain (architect, Colin Laird). The photograph shows the two-storey classroom block—see plan. Construction is precast reinforced concrete frame with prefabricated timber cladding units of egg-crate form on the north side to protect the classroom corridor from north-easterly driving rain.*

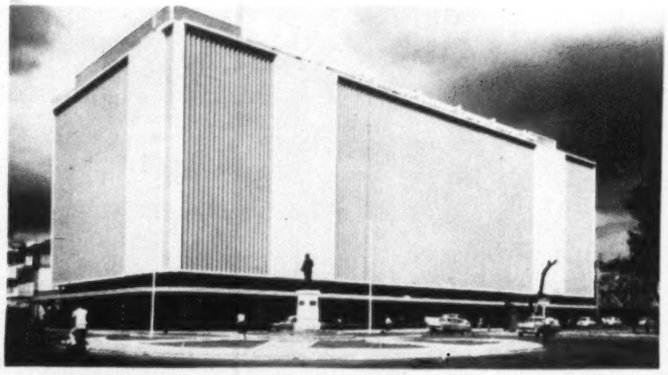
20 *(facing page), staff houses for an oil company, St. Joseph Village (architects, Bolton and Barnstone of Houston, Texas; supervising architect, Colin Laird): built to a semi-standard plan used by the company in various territories. One of the pair of houses looks inward to a patio; the other outwards towards open country and the prevailing breeze. Construction is timber on stone bases.*

20→


TRINIDAD & TOBAGO ELECTRICITY

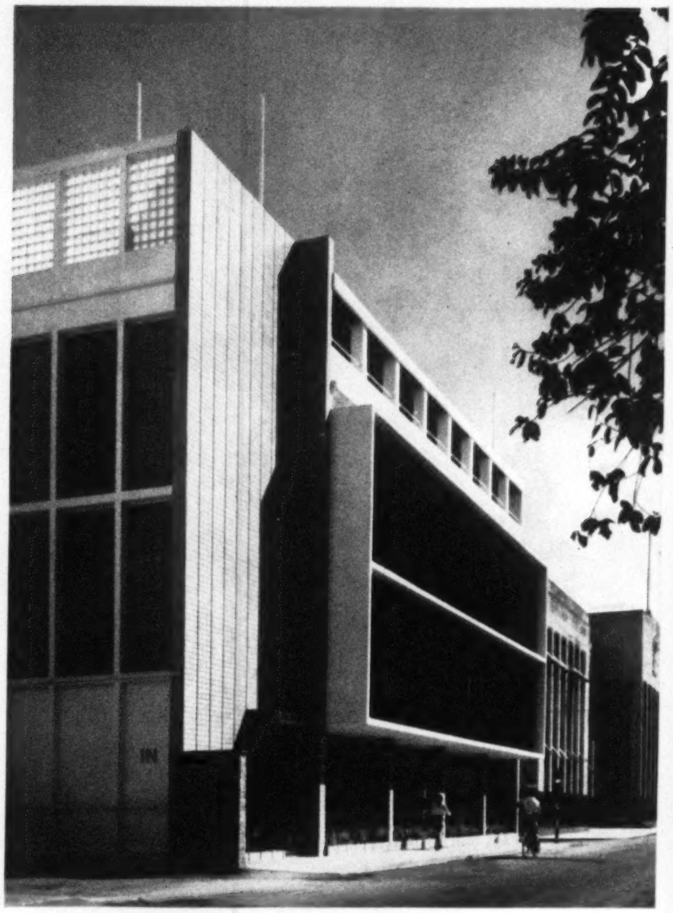


TRINIDAD



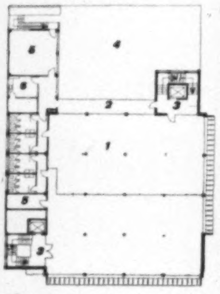
21

21, *office and store building, Port-of-Spain (architects, W. H. Watkins and Partners): the tallest building in Trinidad, 106ft. high. The sales area occupies the general and first floors, which are connected by escalators. Above are four floors of lettable office space and on the top floor a caretaker's flat and eleven luxury apartments with views south and west to the Gulf of Paria and north to the mountains. The whole building is air-conditioned. The main façades have continuous curtain-wall glazing, protected against glare by fixed vertical aluminium louvres.*

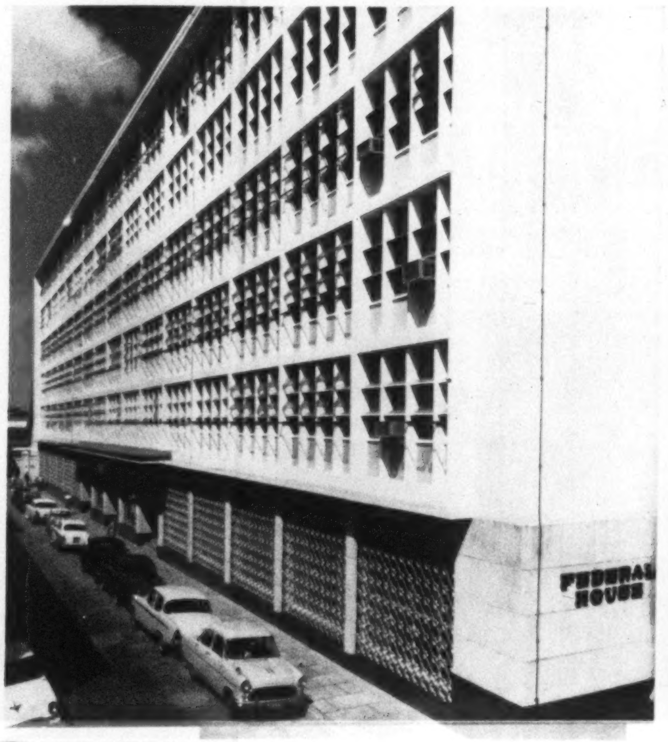


22

22, *office building, Port-of-Spain (architects, Prior, Lourenco and Nothnagel): a three-storey block designed for the later addition of two more floors. The ground floor provides showroom space, and this and the office space above (see plan) has lifts and staircase at the south-west and north-east corners and services grouped along the west side to allow freedom to sub-divide the floor-space as required. Construction is reinforced concrete. The south and east façades are protected by vertical adjustable louvres. The building is air-conditioned.*

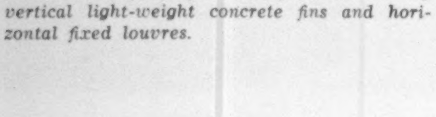


key
1. general office.
2. balcony.
3. foyers.
4. yard below.
5. stores.
6. tea room.



23

23 (*right*), *Federal House, Port-of-Spain (architects, Trinidad Works Department; architect in charge, L. E. Cornialliac): a six-storey office building originally designed for the Colony Government but subsequently leased to the new Federal Authority. It is fully air-conditioned.*

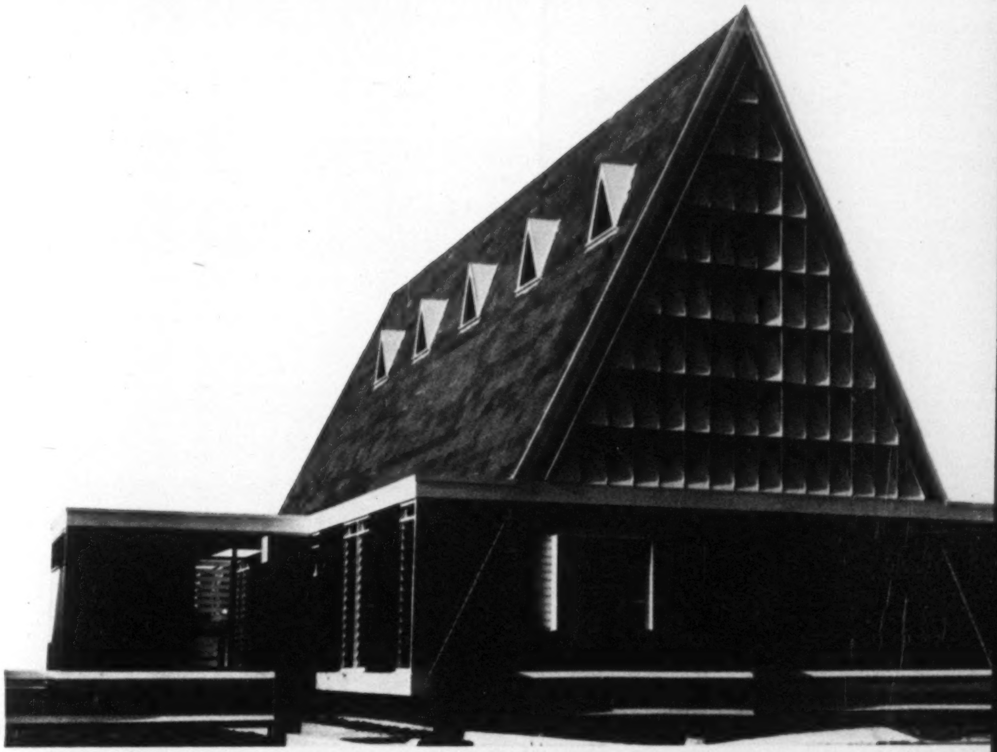


24

24 (*above*), *office building, Point Fortin (architects, Prior, Lourenco and Nothnagel): a four-storey air-conditioned block with floor-space designed for maximum flexibility of subdivision by steel partitions. Construction is reinforced concrete with two north-east and south-west façades protected from the sun by vertical light-weight concrete fins and horizontal fixed louvres.*

BRITISH GUIANA

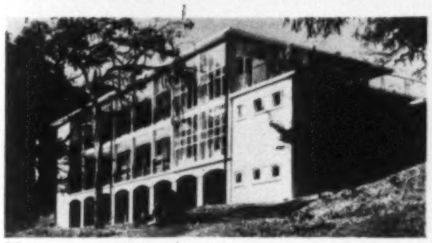
25, Christian Science church, British Guiana (architects, Mence and Moore), seating 100 people. It is built wholly of timber: local hardwoods treated against termites. The main roof beams are of greenheart and are unsupported between the ground and the ridge. They are 10ft. apart and they and the secondary rafters are exposed internally. The roof is covered with grey asbestos slates. Boarded walls are oiled, with fascias painted white. The fixed louvres in the north and south gables are of asbestos in hardwood mullions. The dormer windows have green anti-sun glass.


25

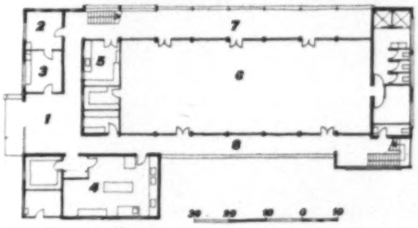
WINDWARD ISLANDS

26, Victoria Hospital, St. Lucia (architect, Michael V. Smith, executive government architect, Windward Islands): the new T.B. ward, which is the first stage of the rebuilding of a nineteenth-century hospital on a very steep site. The floor above the arcade contains the female ward and the top floor the male ward.

27, Princess Margaret Hospital, Dominica (architect, Michael V. Smith, executive government architect, Windward Islands), laid out in parallel blocks, running north-south, connected by covered ways. (See plan beneath photograph) and largely built by direct labour. The photograph shows the private patients' block.


26

27



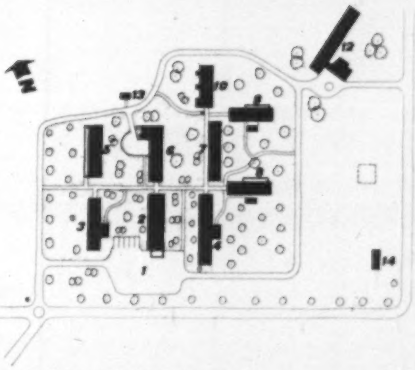
typical floor plan, Victoria Hospital, St. Lucia

key

1, waiting.
2, doctor's office.
3, treatment room.
4, kitchen.
5, ward pantry.
6, female ward.
7, verandah.
8, covered way.

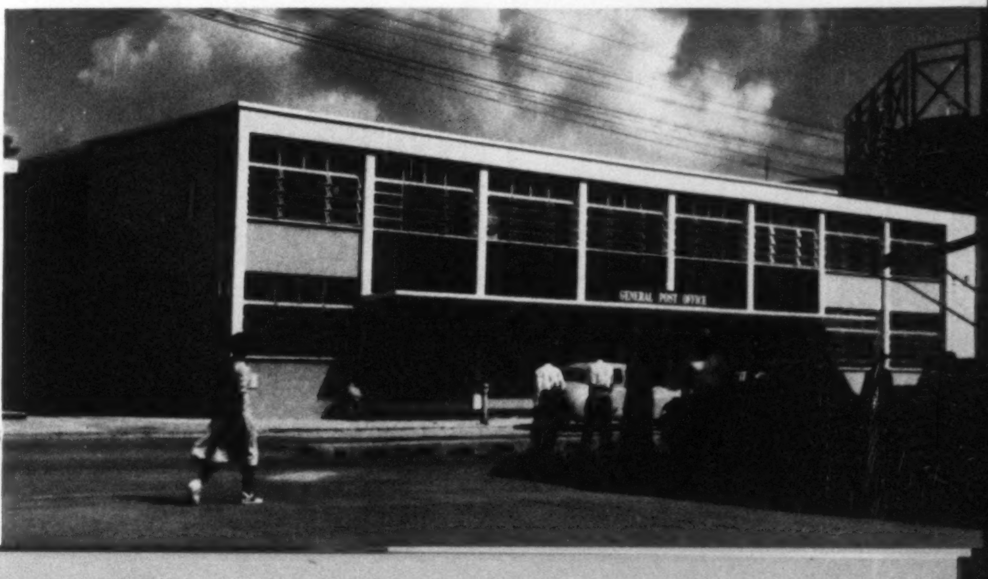
key: hospital at Dominika

1, car parking.
2, admin.
3, medical wards.
4, maternity and children's wards.
5, isolation and observation wards.
6, laundry and kitchen.
7, operating theatre and x-ray.
8, female surgical block.
9, male surgical block.
10, private patients.
12, nurses' hostel.
13, mortuary.
14, matron's quarters.



site plan, hospital at Dominika

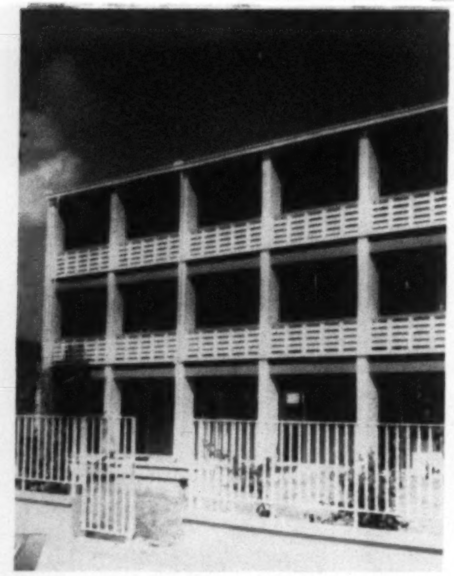
28, post office, Castries, St. Lucia (architect, Michael V. Smith, executive government architect, Windward Islands). It was constructed after the fire in 1948 which destroyed the whole commercial centre of the town.



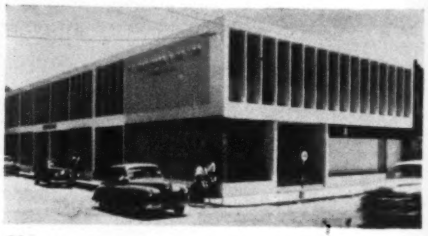
28

LEEWARD ISLANDS

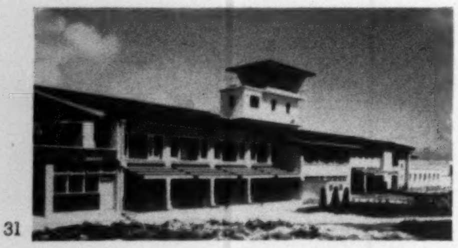
29, *Government offices, St. John's, Antigua (architects, Robertson Ward Associates). The building also contains the offices of the Administrator and the Ministers and their staffs. It is one room deep to give cross ventilation, with access galleries on the lee side of the building. It has a reinforced concrete frame with concrete block walls and steel truss roof covered in asbestos. Balustrading to the galleries is precast concrete.*


29

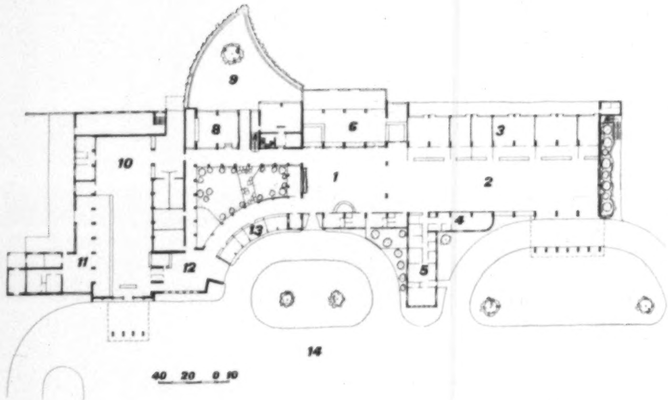
30 *(below), offices and warehouse, Basseterre, St. Kitt's (architects, McMorris and Sibley), sited close to the harbour and containing also a retail shop and a travel agency. The structure is reinforced concrete with walls of local limestone and concrete blocks. On the south-west and north-west elevations (seen in photograph) aluminium louvred windows are fitted between vertical concrete fins.*


30

BARBADOS

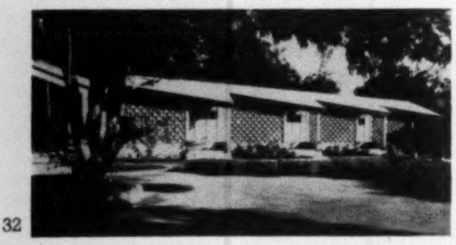

31

31, *terminal building, Seawell Airport (architect, K. J. Tomlin, Director of Public Works, Barbados), planned round an open patio—see plan on right; on the first floor are the main concourse and restaurant. Walls and columns are of local coral limestone, with steel roof covered in asbestos.*

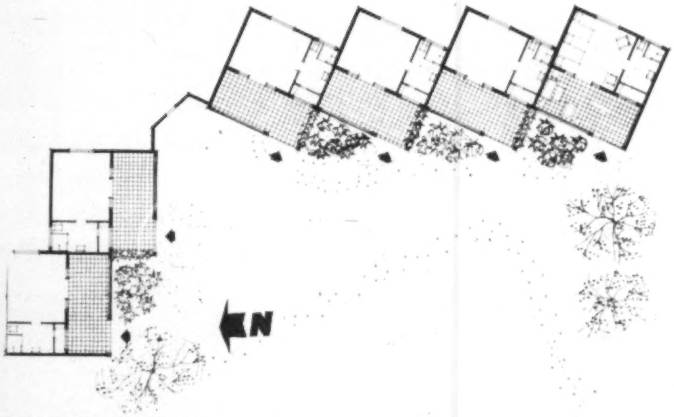


key
1, waiting room.
2, airlines' concourse.
3, airlines' offices.
4, aircrews' room.
5, general office.
6, departure lounge.
8, cocktail lounge.
9, observation patio.
10, customs and immigration.
11, baggage unloading.
12, reception hall.
13, shops.
14, car park.

ground floor plan, terminal building, Seawell Airport


32

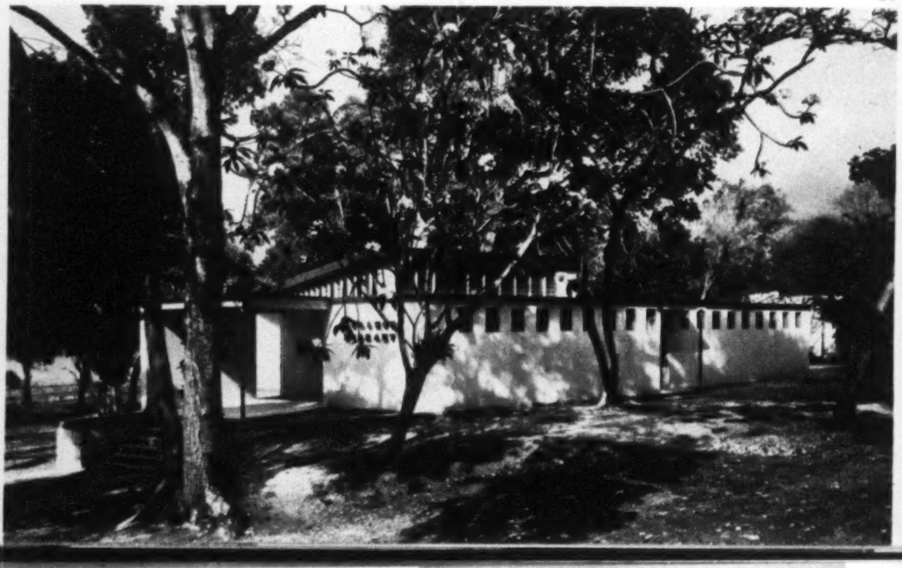
32, *hotel extension (architect, Barbara Hill): two blocks with six cabana-type luxury apartments—see plan on right—serving also to shelter the swimming-pool from the wind. Gardens are reached through the connecting wall. The apartments are staggered in plan to give privacy. The front panels are a grille formed of local clay pots.*



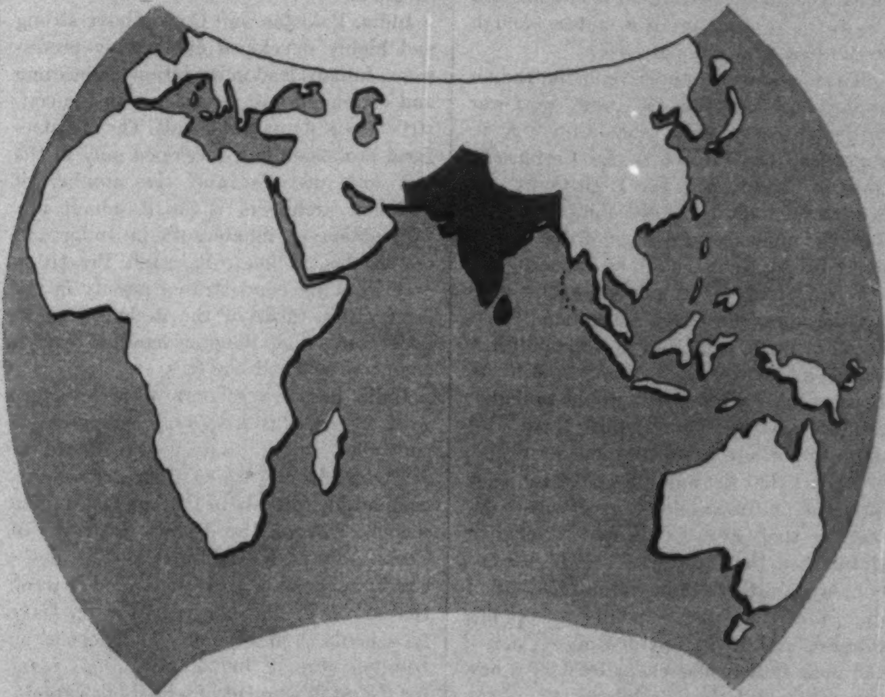
ground floor plan, hotel extension

33 *(right), school library (architect, Anthony C. Lewis)—for Harrison College, but sited in a wooded area away from the other school buildings. The walls have a saw-tooth plan to increase the extent of wall-space for shelving. A clerestory roof increases convection. The photograph shows the library from the rear, with the reference wing on the right.*

33



O. H. Koenigsberger



INDIA, PAKISTAN AND CEYLON

For the poor of Asia shelter has always been, and still is, a matter of self-help. The peasants of India, Pakistan and Ceylon need but little of it, because most of their lives are spent in the open; but they do need some protection from sun and rain, occasional privacy, and safe storage places for their belongings. Their urge to beautify and decorate is seldom applied to the whole house, but to essential parts, such as the door or threshold (the Indian housewife decorates the threshold of her house every morning with patterns of rice flour), to images of domestic gods, oil lamps, clay or brass pots and other objects of daily use. The flowers used to adorn the domestic altar and the hair-do of women are significant signs of the need to brighten an incredibly hard and drab life.

The poor man's (and woman's) need for spectacular buildings as subjects of his day-dreams was catered for in the past by the houses of his gods with their incredible wealth of figurative decoration, and by the splendour of the palaces of maharajas and emperors. The fact that the architecture of the imperial palaces from the Moguls to the British Viceroys was basically foreign and that of the maharajas imitated the worst Victorian horrors did not affect its capacity to satisfy this need.

Independence brought a complete change. Gandhi and his disciples had established an image of a new country that was both romantic (going back to the simple life and self-contained economy of the village, wearing hand-spun and hand-woven cloth) and puritan (prohibition, reduction of top pay-scales, abolition of rajahs, imposition of a luxury tax). The leaders of the new India accepted Lutyens's New Delhi as a convenience, but resented it as an inappropriate setting for the hard-working public servants of a poor country. They prepared five-year plans for a community of responsible citizens and scorned any idea of fobbing off the ruled with *panem et circenses.*

It was in keeping with this general attitude, which prevailed to a lesser degree also in the first years of the new Pakistan and Ceylon, that architectural interest concentrated at first almost exclusively on low-cost housing. The best brains of the three countries were concerned with new towns (India started twelve between 1945 and 1951), prefabrication, village improvement and community development.

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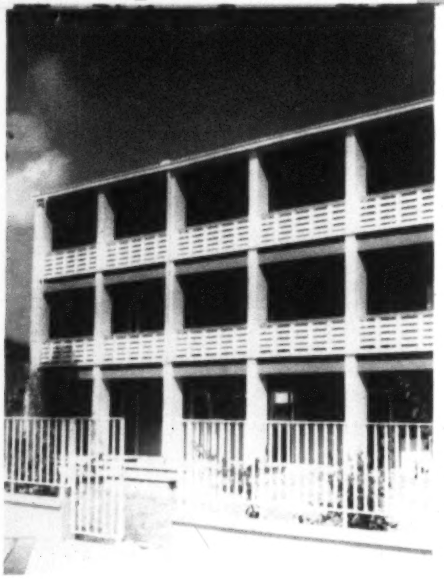
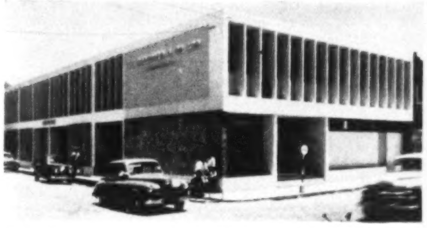
LEEWARD ISLANDS

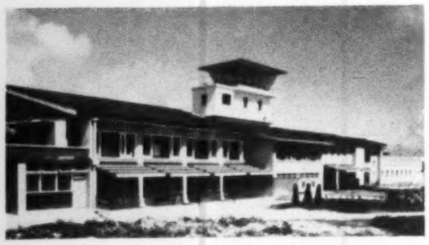
29, Government offices, St. John's, Antigua (architects, Robertson Ward Associates). The building also contains the offices of the Administrator and the Ministers and their staffs. It is one room deep to give cross ventilation, with access galleries on the lee side of the building. It has a reinforced concrete frame with concrete block walls and steel truss roof covered in asbestos. Balustrading to the galleries is precast concrete.


29

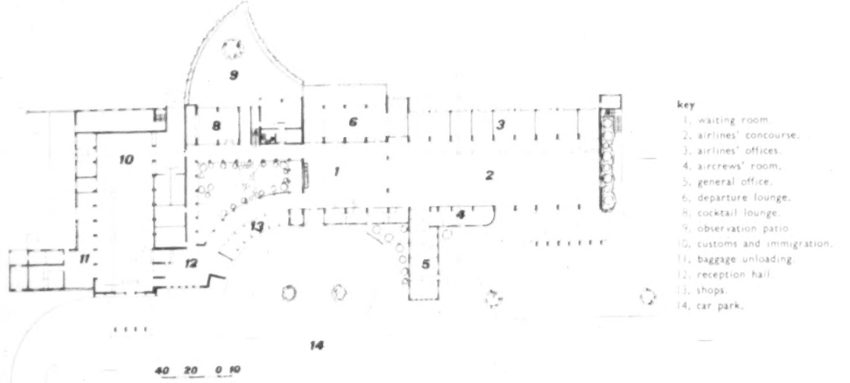
30 (below), offices and warehouse, Basseterre, St. Kitt's (architects, McMorris and Sibley), sited close to the harbour and containing also a retail shop and a travel agency. The structure is reinforced concrete with walls of local limestone and concrete blocks. On the south-west and north-west elevations (seen in photograph) aluminium louvred windows are fitted between vertical concrete fins.


30

BARBADOS


31

31, terminal building, Seawell Airport (architect, K. J. Tomlin, Director of Public Works, Barbados), planned round an open patio—see plan on right; on the first floor are the main concourse and restaurant. Walls and columns are of local coral limestone, with steel roof covered in asbestos.


9
8
6
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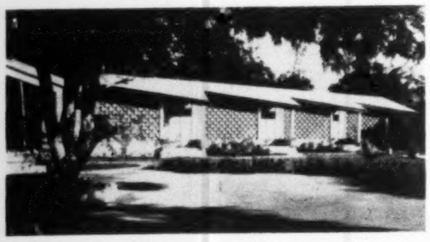
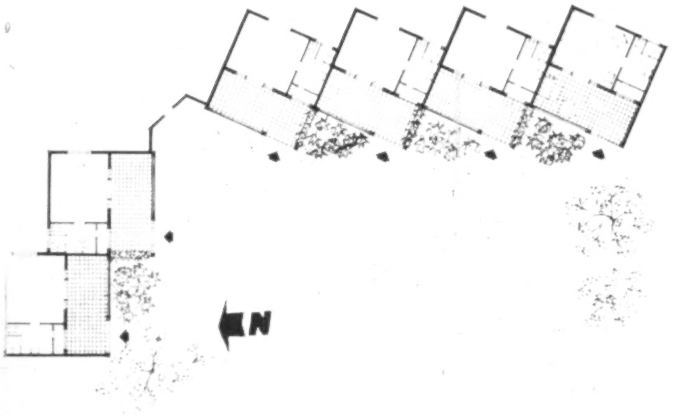
40 20 0 10
key
1, waiting room.
2, airlines' concourse.
3, airlines' offices.
4, aircrews' room.
5, general office.
6, departure lounge.
8, cocktail lounge.
9, observation patio.
10, customs and immigration.
11, baggage unloading.
12, reception hall.
13, shops.
14, car park.

ground floor plan, terminal building, Seawell Airport


32

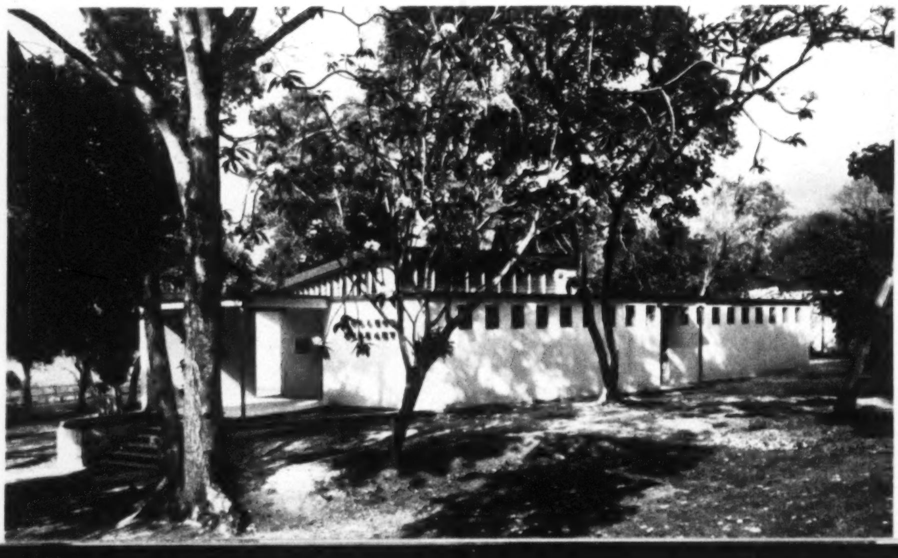
32, hotel extension (architect, Barbara Hill): two blocks with six cabana-type luxury apartments—see plan on right—serving also to shelter the swimming-pool from the wind. Gardens are reached through the connecting wall. The apartments are staggered in plan to give privacy. The front panels are a grille formed of local clay pots.



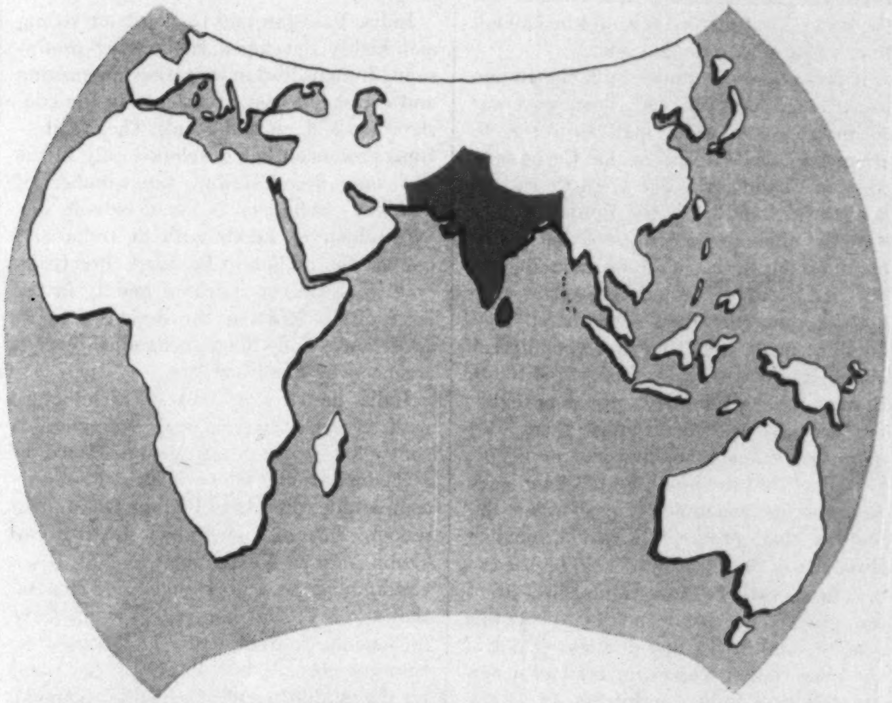
ground floor plan, hotel extension

33 (right), school library (architect, Anthony C. Lewis)—for Harrison College, but sited in a wooded area away from the other school buildings. The walls have a saw-tooth plan to increase the extent of wall-space for shelving. A clerestory roof increases convection. The photograph shows the library from the rear, with the reference wing on the right.

33



O. H. Koenigsberger



INDIA, PAKISTAN AND CEYLON

For the poor of Asia shelter has always been, and still is, a matter of self-help. The peasants of India, Pakistan and Ceylon need but little of it, because most of their lives are spent in the open; but they do need some protection from sun and rain, occasional privacy, and safe storage places for their belongings. Their urge to beautify and decorate is seldom applied to the whole house, but to essential parts, such as the door or threshold (the Indian housewife decorates the threshold of her house every morning with patterns of rice flour), to images of domestic gods, oil lamps, clay or brass pots and other objects of daily use. The flowers used to adorn the domestic altar and the hair-do of women are significant signs of the need to brighten an incredibly hard and drab life.

The poor man's (and woman's) need for spectacular buildings as subjects of his day-dreams was catered for in the past by the houses of his gods with their incredible wealth of figurative decoration, and by the splendour of the palaces of maharajas and emperors. The fact that the architecture of the imperial palaces from the Moguls to the British Viceroys was basically foreign and that of the maharajas imitated the worst Victorian horrors did not affect its capacity to satisfy this need.

Independence brought a complete change. Gandhi and his disciples had established an image of a new country that was both romantic (going back to the simple life and self-contained economy of the village, wearing hand-spun and hand-woven cloth) and puritan (prohibition, reduction of top pay-scales, abolition of rajahs, imposition of a luxury tax). The leaders of the new India accepted Lutyens's New Delhi as a convenience, but resented it as an inappropriate setting for the hard-working public servants of a poor country. They prepared five-year plans for a community of responsible citizens and scorned any idea of fobbing off the ruled with *panem et circenses*.

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Public buildings, instead of being welcomed as opportunities of expressing the aspirations of the new countries, were treated as necessary evils. Confusion reigned as to their shape and style. The 'moderns' wanted to prove that Asians could do as well or better than the West in applying new technologies. The traditionalists advocated a return to historical patterns in the belief that one could thereby create something typically Pakistani, Indian or Ceylonese. Many intellectuals thought that attention to climate and the use of local materials would be enough to create a new national style.

It is necessary to understand the Indian background as well as these post-war currents of emotion and thinking to appreciate the impact of Le Corbusier's work at Chandigarh. The High Court and Secretariat building of the Punjab capital were the urgently needed proof that public buildings in India could be modern, yet different from contemporary work—even by the same architect—elsewhere. That does not mean that they were popular. A public-opinion poll amongst literate Indians (still a minority) would probably produce a strong vote against them. But more important than approval or dislike is the fact that the buildings of Chandigarh were the first examples of post-war architecture that aroused heated discussion throughout the country. Their high costs enhanced rather than diminished their importance as focal points of public interest, and of the day-dreams—if not of the poor Indian masses, at least of a new generation of Indian architects.

After the completion of these Chandigarh buildings we find at various points of the sub-continent architects who if they do not exactly imitate Le Corbusier, have the courage of their own convictions and try to find their own mode of expression. They are still lonely swallows, but they *are* emerging. Their efforts are helped by the trends of the second and third five-year plans which have gone far towards restoring the balance between village development on the one side and industrialization and modern technology on the other and have increased confidence in technical progress.

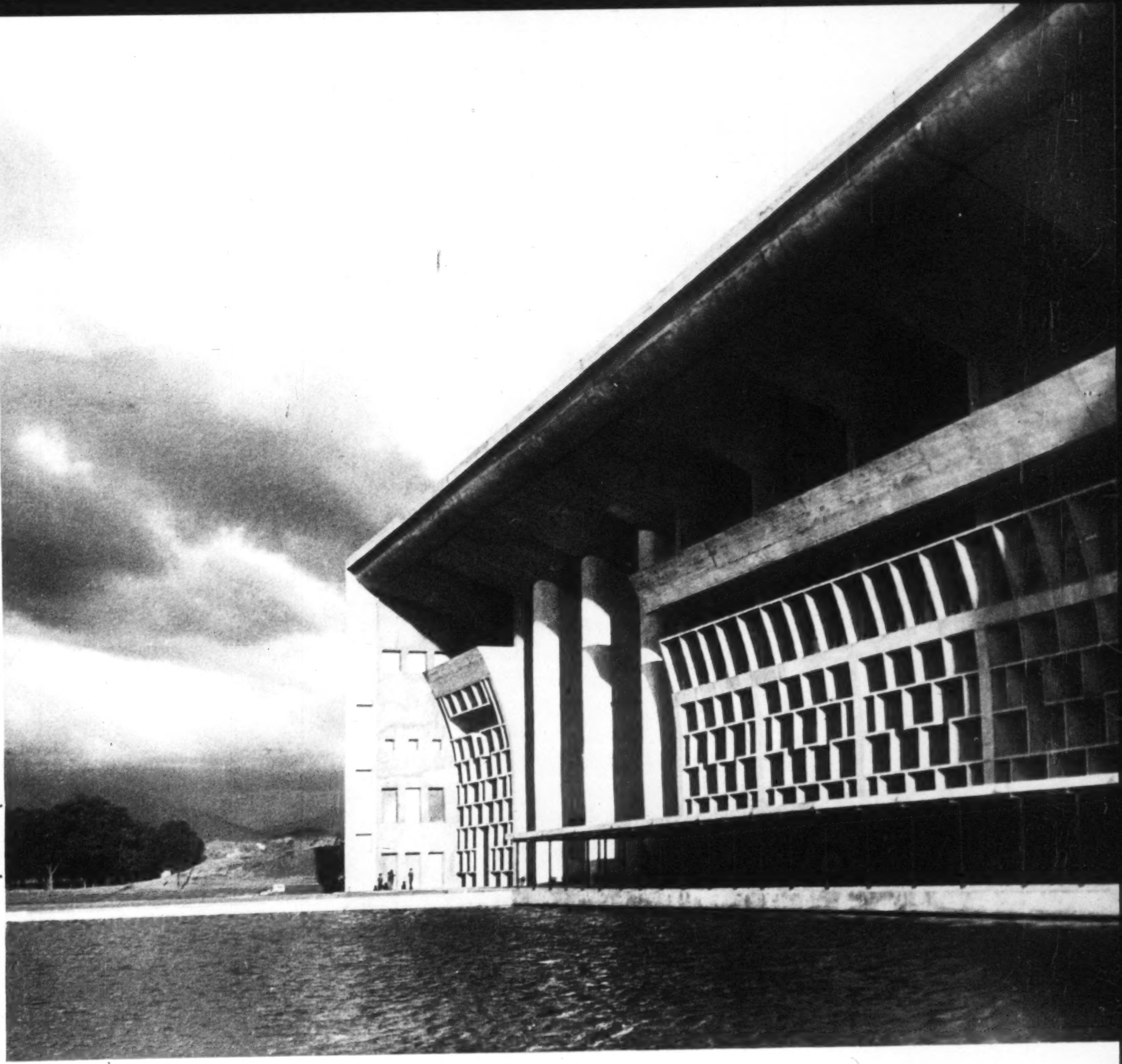
India, Pakistan and Ceylon have strong and highly developed engineering professions. Indians lead in irrigation engineering and command vast experience in the construction of dams and canals. The architectural profession has developed only in the last four decades, and the number of qualified architects is small—about one per million of inhabitants in India and one per ten million in Pakistan. Practising architects are concentrated mainly in the large cities. Most of the design work in small towns and villages is handled by civil engineers or small builders.

India has five schools of architecture with five-year courses and examinations controlled by a governmental Board of Technical Studies which aims at standards comparable to those in Britain. One Indian school, that of the Indian Institute of Technology at Kharagpur (Bengal), has a Graduate School of Design modelled on that of MIT. Pakistan and Ceylon have no schools of architecture and depend on training abroad, but Pakistan has plans for the establishment of schools at Karachi, Lahore and Dacca, one under Colombo Plan auspices and the other two with the help of the Ford Foundation.

An architect practising in Bombay or Calcutta could in theory command all the materials and equipment available to his colleagues in the West. In practice, he is restricted by shortages of steel (Indian steel production is increasing rapidly, but is still far short of the country's needs), and his choice of panelling and cladding materials and fittings is limited. More and more building materials and components are made in India, but many of the less frequently used items must be imported. The shortage of steel accounts for the almost complete absence of steel-frame construction and the preponderance of concrete. The use of large areas of glass is ruled out by climatic considerations.

Air conditioning is used more and more in important commercial and public buildings, but is still far too expensive for universal application. In most buildings, the architect must combat severe climatic conditions without it. India, Pakistan and Ceylon include climatic regions of great variety and contrast, ranging from the warm-humid equatorial areas of Western Ceylon, the Malabar Coast and Bengal to the hot-dry desert or near-desert conditions of Rajputana and Sind. Large areas of the sub-continent have Intermediate or Monsoon climates; that is, they are hot and dry for almost two-thirds of the year and warm and humid for the remainder. The hill-towns of the Himalayas have to cope with severe winters, settlements in Assam and in the Malnad 'boast' of the highest rainfall figures in the world and some areas such as the Mysore plateau enjoy a pleasant almost sub-tropical climate.

Traditional building practices and local materials vary in accordance with the different climates, and these affect contemporary buildings as they have affected those of the past. It is still far too early to discern clearly Indian, Pakistani, or Ceylonese architectural movements. The new countries of Asia need time to develop modern vernaculars of their own, but promising beginnings can be found as the following pages show.

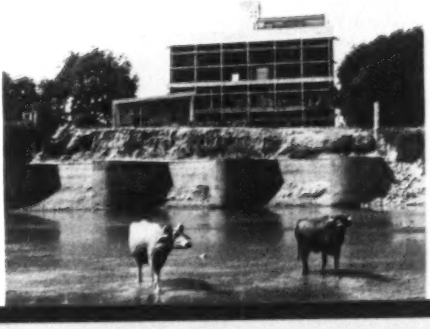


1

1. *the High Court at Chandigarh, the new capital of East Punjab, of which Le Corbusier is the planner as well as being the architect of this and other public buildings. The High Court forms one of a group of buildings, all of fully exposed reinforced concrete, raised up above the rest of the city on what is known as the capitol, at the northern end of the main axis. The photograph shows the southern side, seen across an artificial pool.*

INDIA

2



2. *the Millowners' Building at Ahmedabad (architect, Le Corbusier): an office building, containing also conference and meeting rooms, for the local Association of Millowners. It is of exposed reinforced concrete construction and is shown in the photograph from across the Sabarnati river.*

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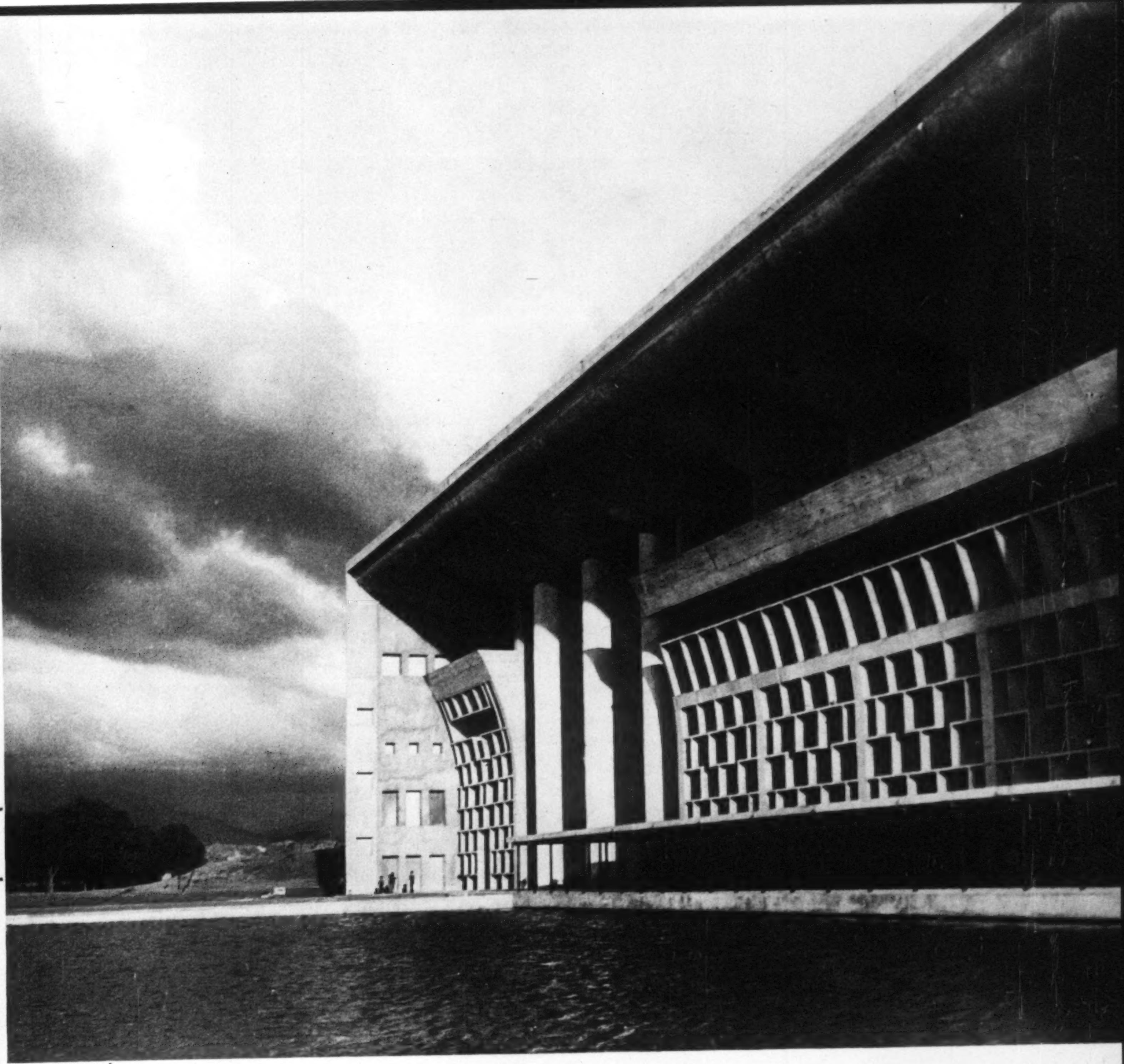

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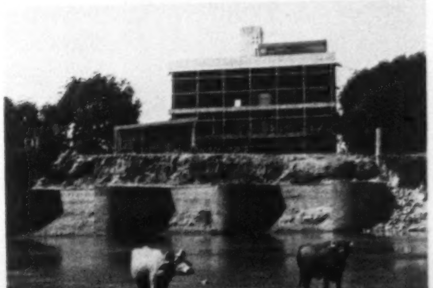
INDIA

2



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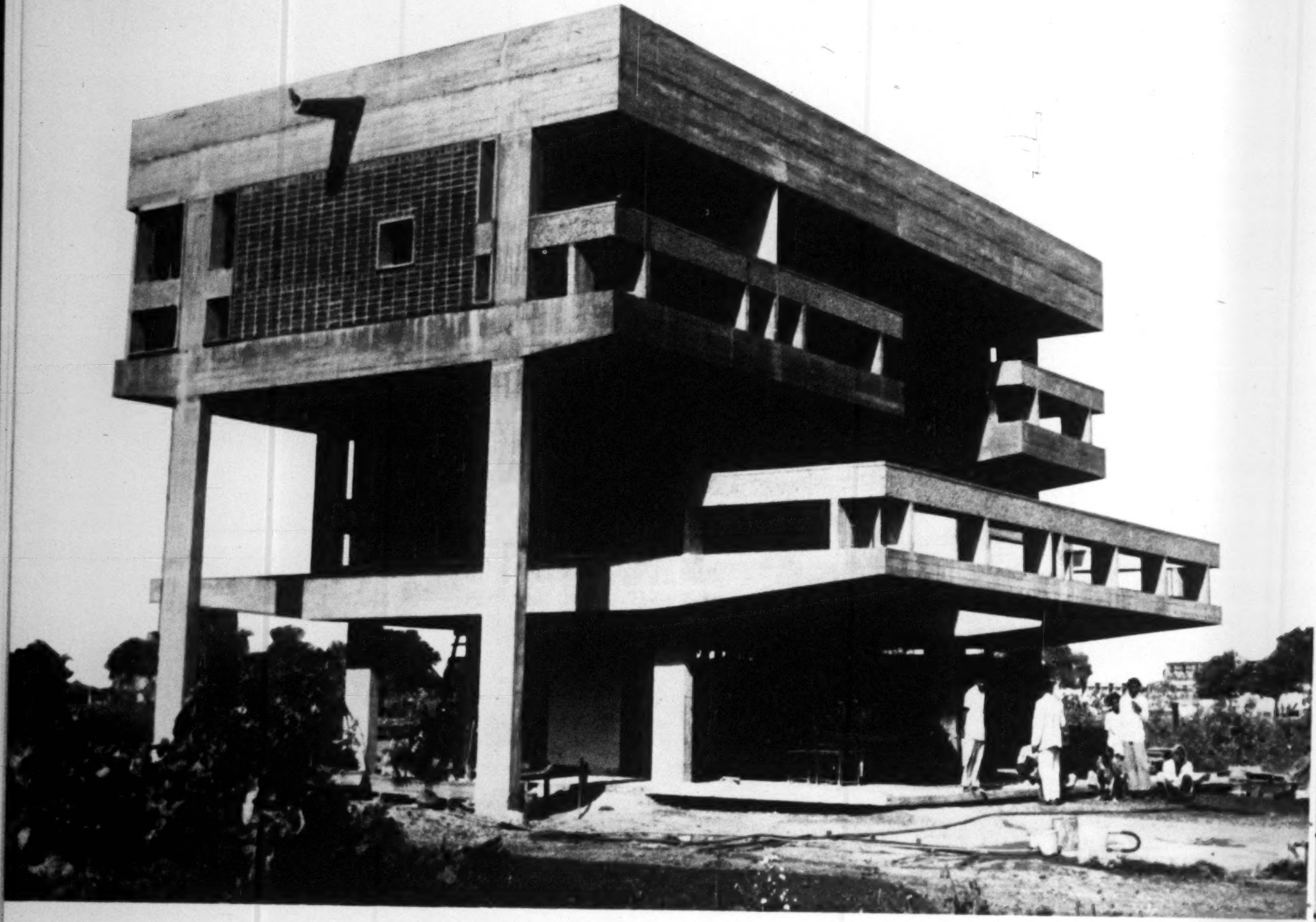
INDIA



3

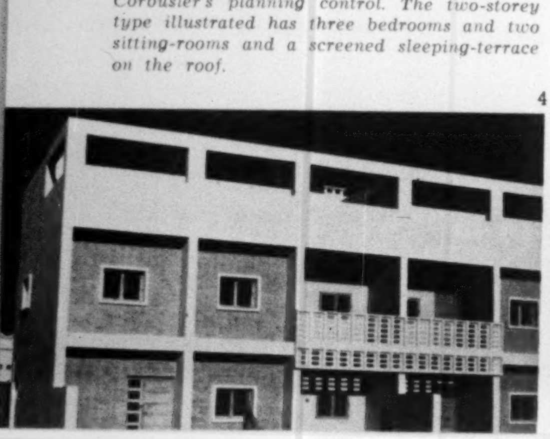
3 (above), Chinubhai house at Ahmedabad (architects, Vastu-Shilpa): a three-storey house with exposed reinforced concrete frame incorporating cantilevered slabs forming balconies. The small amount of infill walling is of narrow red bricks laid with straight joints.

4 (below), housing at Chandigarh, East Punjab (architect, E. Maxwell Fry): part of a terrace of one of the numerous standardized house-types evolved for the residential quarters of the city by Maxwell Fry, Jane Drew and Pierre Jeanneret, all working under Le Corbusier's planning control. The two-storey type illustrated has three bedrooms and two sitting-rooms and a screened sleeping-terrace on the roof.

5, Shodhan house at Ahmedabad (architect, Le Corbusier): in exposed concrete showing the imprint of the timber shuttering, except on the soffit of the roof where the surface is smooth, derived from sheet-metal shuttering, and brightly coloured. The house has a complicated section with the main living-rooms, etc., half-way up. This floor and the mezzanine below it are reached by an internal ramp.

6, Nalini Banker house, Ahmedabad (architects, Vastu-Shilpa; partner in charge, Balkrishna V. Doshi): a single-storey, two-bedroom house, rectangular in plan with a central courtyard open on one side. The photograph shows the south end, with recessed porch leading straight into the living-room and, on the left, the two corner windows of the main bedroom. Construction is reinforced concrete with brick infill.

4



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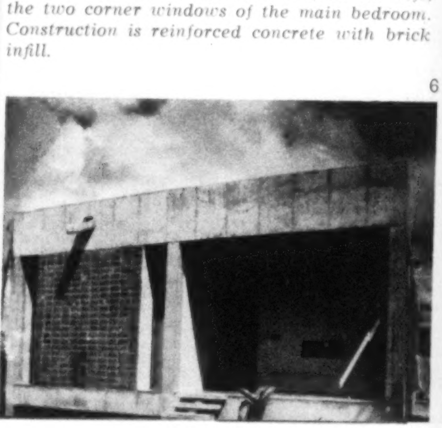
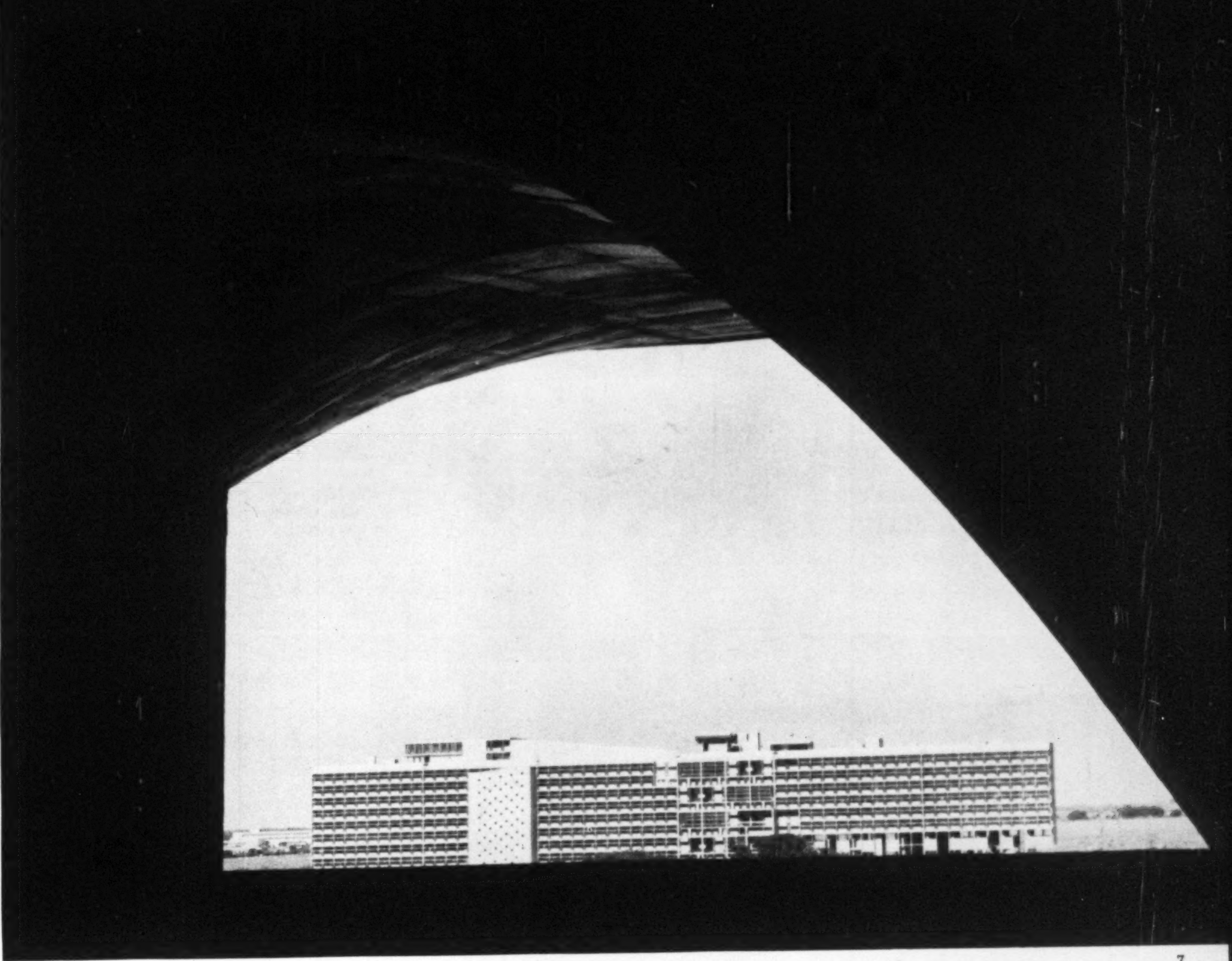


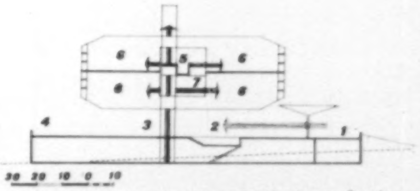


7

7 (above), the Secretariat, Chandigarh (architect, Le Corbusier). It stands on the capitol at the northern end of the city, but at the opposite side from the High Court (see page 55), from the roof of which the photograph is taken, looking north-west. Eventually the parliament building will be between them. It accommodates 3,000 employees and is divided vertically by a series of expansion joints into six ministerial blocks, each consisting of office-space either side of a central corridor. The wall with small apertures to the left of the centre of the façade is that of an enclosed ramp standing out at an angle and serving all floors. The section further to the right, with a changing pattern of brise-soleil, is that of the Ministers' offices. The roof-top structures house club-rooms, etc.

8 (below), Utkal University, Bhubeneswar in Orissa Province (architects, Chatterjee and Polk): the still uncompleted range of buildings sited on the flat plain north-west of the bay of Bengal.

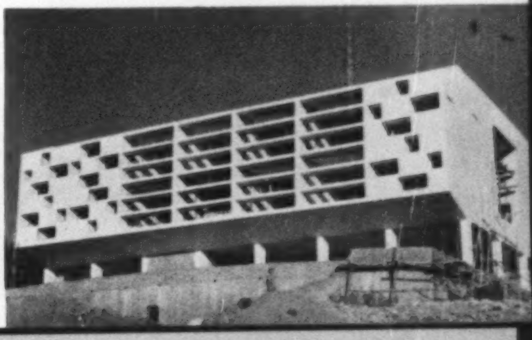
9 (far right), hotel at Ahmedabad (architect, C. M. Correa). The riverside site slopes steeply and the entrance driveway takes cars up to first floor level, where the public lounges, dining-rooms, etc., are placed—see section right. At the lower level is a general-purpose public room opening on to the garden and a shopping arcade. The bedrooms above are planned round an internal garden and a lift and service core. The base of the building is of exposed brick and the upper part plastered white.



key 1, drive. 2, entrance. 3, lounge. 4, terrace. 5, bridge. 6, rooms. 7, garden.

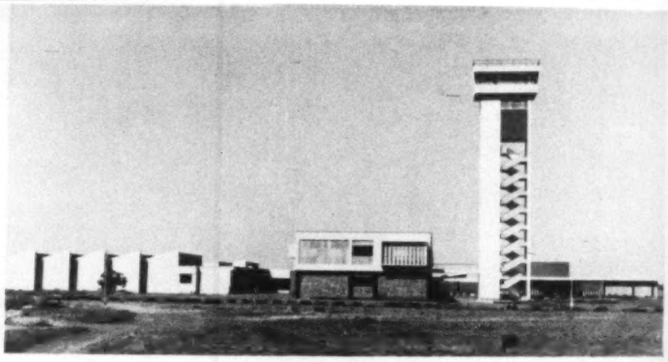
8

9

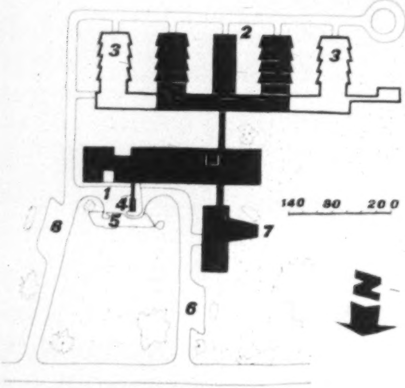


INDIA

10 (far right), Central Electronics Research Institute, Pilani, Rajasthan province (architects, Kanvinde and Rai): one of a chain of national research laboratories. The buildings, on a flat site, are in three groups—see plan on right: the main group, housing the quieter activities (centre of photograph), including offices, research laboratories, museum and library; a lecture theatre and cafeteria group (on the right behind the tower), and a technological group containing workshops, etc. (on the left). The tower, which is linked to the main buildings by a bridge, is for cosmic ray research. The structure is a reinforced concrete frame with brick infill walls, faced with stone on the main buildings which also have a system cf vertical adjustable asbestos louvres for sun-protection.


10

key
1, entrance to main block.
2, technological block.
3, future extensions.
4, tower.
5, cooling pond.
6, car park.
7, auditorium.

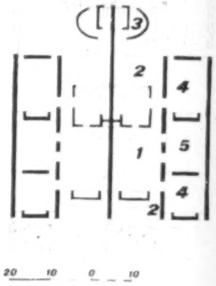


site plan, Central Electroni: Research Institute, Pilani.

11

11 (above), staff houses for the Physical Research Laboratory, Ahmedabad (architects, Vastu-Shilpa; partner in charge, Balkrishna V. Doshi): one of a series of dwelling types evolved for research organizations. Construction is wholly brick, including the vaulted roofs. Windows are unglazed, and have either wooden shutters or metal louvres. The 4in. slit under the vault has only flywire.

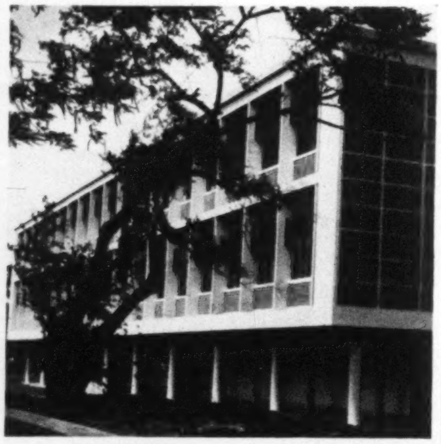
key
1, living room.
2, verandahs.
3, lavatory.
4, bedrooms.
5, courtyard.



plan, staff houses at Ahmedabad.

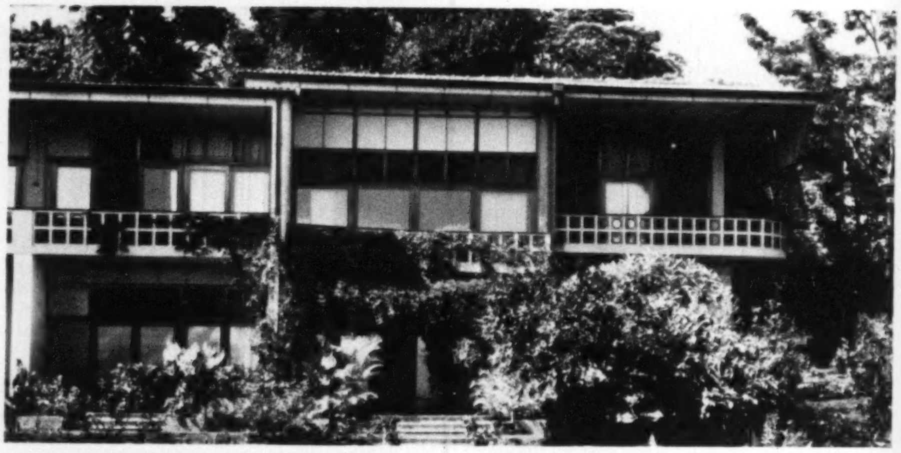
PAKISTAN

12, public library, Dacca (architect, Muzharul Islam). It is of reinforced concrete construction and the reading-room wing on the far side has a vaulted roof of shell concrete. Also in Dacca (capital of East Pakistan) is a Government institute of arts by the same architect.


12

CEYLON

13, house at Kandy (architect, Minnette de Silva). The photograph shows the garden front. The different sections of the house change level to follow the slope of the ground. Construction is reinforced concrete and timber.

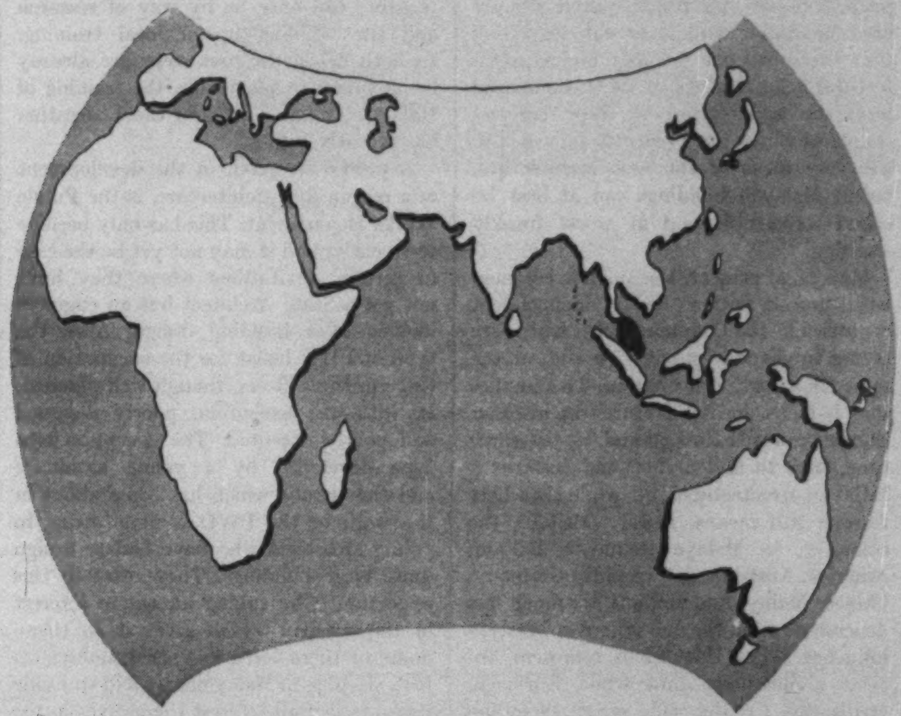

13

14 and 15, house at Colombo (architect, Minnette de Silva): a reinforced concrete structure planned round a garden court. 14, looking from the entrance through the living-room into the garden. On the left is a wooden trellis between living-room and courtyard. 15, shows the car-port beneath the overhanging first floor, with the courtyard to the left. The triangular vents in the gable are traditional in shape and also serve as niches for oil-lamps during festivals.

14

15

Julius Posener



MALAYA

The Federation of Malayan States occupies that thin limb which the Asian continent throws out in a south-easterly direction, very nearly touching the Equator, known geographically as the Malacca Peninsula. It is virtually an island, the smallest of the Sunda Archipelago isles which include Sumatra and Borneo. Architecturally it possesses but thin local traditions and, consequently, few viable local prototypes of buildings. At the same time, it lies across the main road of world trade and is, therefore, immeasurably more advanced and Westernized than its neighbours.

Half the present population consists of recent immigrants: Chinese, Indians, Europeans. Of these, the Chinese form by far the largest, and also the most conspicuous, element. The other half, though having a much older birthright in the peninsula, is likewise not indigenous, for the Malays, too, are immigrants. The truly native element is represented by the remnants of tribal population living in the hills of the less Westernized among the Malayan states. As a subject for study, in particular for their ways of living in houses and building them, they are full of interest; as a community in the Federation they are practically without influence.

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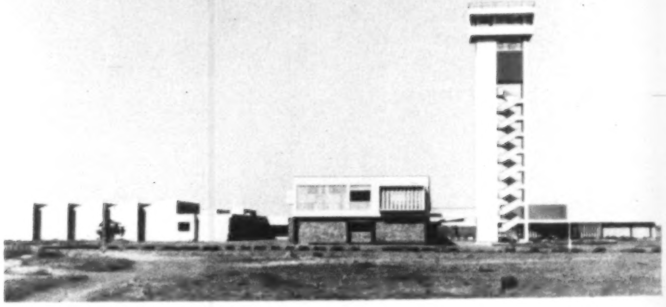
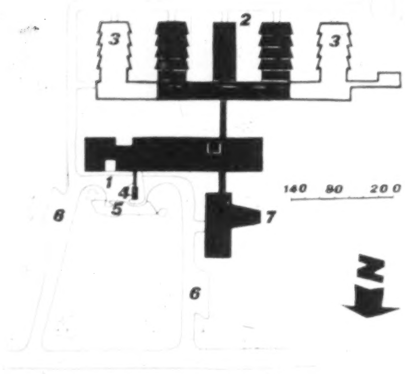
INDIA

10 *(far right), Central Electronics Research Institute, Pilani, Rajasthan province (architects, Kanvinde and Rai): one of a chain of national research laboratories. The buildings, on a flat site, are in three groups—see plan on right: the main group, housing the quieter activities (centre of photograph), including offices, research laboratories, museum and library; a lecture theatre and cafeteria group (on the right behind the tower), and a technological group containing workshops, etc. (on the left). The tower, which is linked to the main buildings by a bridge, is for cosmic ray research. The structure is a reinforced concrete frame with brick infill walls, faced with stone on the main buildings which also have a system of vertical adjustable asbestos louvres for sun-protection.*

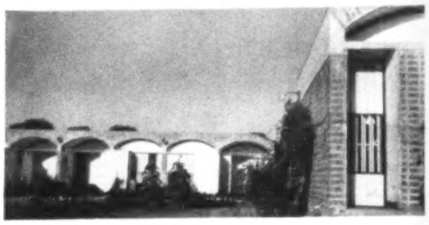


10

key
1, entrance to main block.
2, technological block.
3, future extensions.
4, tower.
5, cooling pond.
6, car park.
7, auditorium.



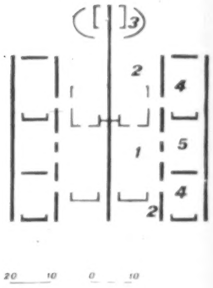
site plan, Central Electroni: Research Institute, Pilani.



11

11 *(above), staff houses for the Physical Research Laboratory, Ahmedabad (architects, Vastu-Shilpa; partner in charge, Balkrishna V. Doshi): one of a series of dwelling types evolved for research organizations. Construction is wholly brick, including the vaulted roofs. Windows are unglazed, and have either wooden shutters or metal louvres. The 4in. slit under the vault has only flywire.*

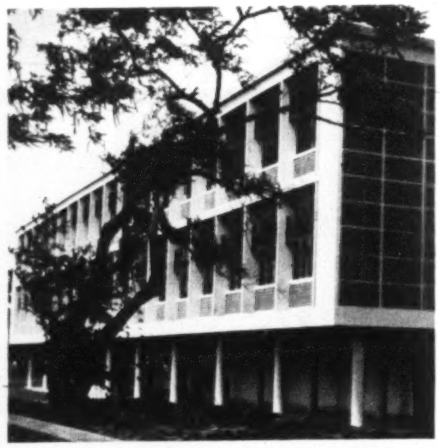
key
1, living room.
2, verandahs.
3, lavatory.
4, bedrooms.
5, courtyard.



plan, staff houses at Ahmedabad.

PAKISTAN

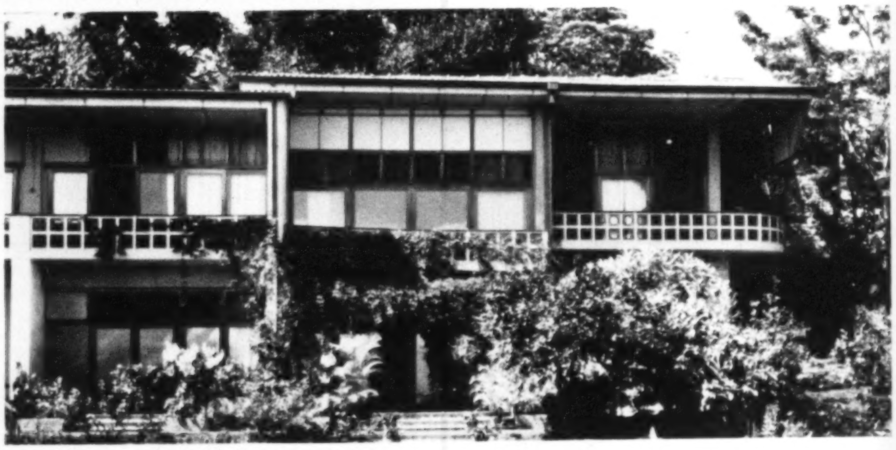
12, *public library, Dacca (architect, Muzharul Islam). It is of reinforced concrete construction and the reading-room wing on the far side has a vaulted roof of shell concrete. Also in Dacca (capital of East Pakistan) is a Government institute of arts by the same architect.*



12

CEYLON

13, *house at Kandy (architect, Minnette de Silva). The photograph shows the garden front. The different sections of the house change level to follow the slope of the ground. Construction is reinforced concrete and timber.*



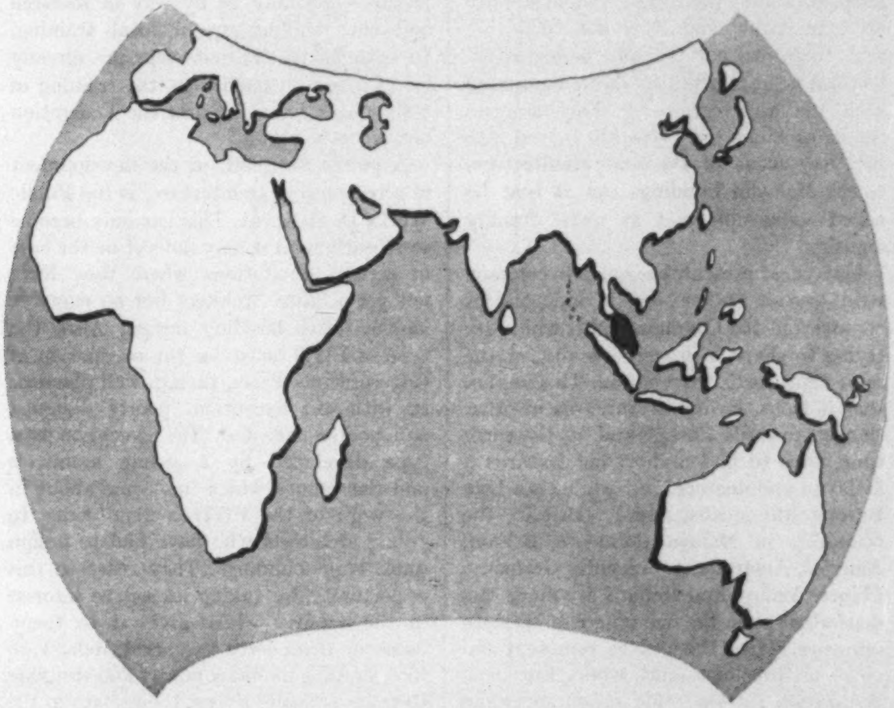
13

14 *and* 15, *house at Colombo (architect, Minnette de Silva): a reinforced concrete structure planned round a garden court.* 14, *looking from the entrance through the living-room into the garden. On the left is a wooden trellis between living-room and courtyard.* 15, *shows the car-port beneath the overhanging first floor, with the courtyard to the left. The triangular vents in the gable are traditional in shape and also serve as niches for oil-lamps during festivals.*

14

15

Julius Posener



MALAYA

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This optimism is based upon one thing mainly: the talent and enthusiasm to be found in both the large communities—Malay and Chinese. If one remembers that architecture, as the West understands it at present, town-planning and housing are all in Malaya very new crafts and sciences indeed, the results visible already are remarkable and it is not surprising that there are not yet any major architectural achievements to show. Compared with the architecture of those tropical countries which have recently moved into the very focus of the new architecture, recent Malayan buildings can at best be called responsible and at worst frankly amusing.

Malaya, at present, has much in common with certain other newly independent countries in the Commonwealth which are trying to shape a progressive and, at the same time, distinctive nation. This implies that it looks, in architecture—as in other things—towards Europe and, at the same time, tries to find a short cut towards a Malayan architecture. But while elsewhere Europe still means, mainly, Britain, the colonizer, in Malaya it means Britain, America, Australia and recently Germany. Chinese Malays and Indians are much less dependant upon the one source of Western influence. They themselves represent ancient civilizations; and while European civilization (in the wide sense, including oversea Europeanized countries) seems as inevitable here as it would seem to be elsewhere, Chinese and Malays do exercise a choice. They have been meeting Europeans on equal terms since long before Independence, they have been mixing socially, they have been working together in business, in administration, in schools; and there, also, on equal terms.

This greater maturity brings with it its own problems. At present, every foreign plant is being put into the architectural soil of the Federation: and it grows! Nobody can say that the designs made by the many young Chinese architects trained oversea—mostly in Melbourne—are less foreign than the designs of the British architects still guiding the building effort of the Public Works Department, many of the larger municipalities and such public utility bodies as the Central Electricity Board. It may seem paradoxical but it is largely true that the local British architect cares more about a tropical architecture—and certainly no less about a 'Malayan' one—than his Asian colleague. He is also the one who most vigorously campaigns for the use of the local building material, timber, and who devotes a loving interest to the study of traditional Malay and tribal houses. The situation, at times, recalls that ancient cartoon where Serenissimus, visiting a village in his principality, is shown in local garb while the village notables receive him dressed in their towny best.

All recognize, however, that the way towards a suitable tropical architecture for this country—which, in time, may or may not develop into a Malayan architecture—can only be by way of research and the building up of local training. In both fields, the first steps are already being taken; in particular, the training of Malayan architects within the Federation has recently begun.

A power for good, in the development of a responsible architecture, is the Public Works Department. This has only become so recently, and it may not yet be the case in certain outstations where they have not yet a State Architect but an engineer looking after building design. Also, the type of PWD house for the occupation of Government officers, though well planned, is, with one exception, poorly designed and poorly executed. The exception is a type developed by a young architect; and the change which has come about in the work of the PWD is mainly due to young architects who have had to design quite large buildings. They react to this opportunity by taking an active interest in the country which gives it to them. Some of them have traversed Malaya on foot, sleeping in Malay houses and studying them; nearly all interest themselves in the training of architects locally and one, Norman Lehey, has given up his post in PWD to take up full-time teaching at the Technical College.

But their most significant contribution of PWD to the hoped-for future architecture of Malaya is found in its work, some of which is shown on the following pages. Its design may be 'international' or 'European'—it is difficult to see how it could be anything else—but it is sober, restrained and thoughtful. The buildings are, on the whole, well planned and (which is possibly even more important) well detailed; last, but not least, it shows a tendency towards a correct tropical—if not actually a Malayan—way of building. Among practising local architects, there are also some who are moving in the same direction, but the conditions prevailing in a large public office which is its own client are more favourable to experiment.

Another organization with a large and enterprising programme is the Housing Trust, which was established in 1950 and is now working under the Ministry of the Interior. The gigantic nature of the task it has to tackle is indicated by the following extract from a statement issued by the Trust last November:

'From the 1957 census it is found that there are approximately 70,000 families living in squatter huts in urban areas, that a further 45,000 families are living as sub-tenants, mostly in one room, and that in order to house the annual increase in the population, which amounts to 3 per cent, a further 25,000 houses will be needed every year. This means that at least 120,000 houses are needed now to provide homes for badly housed families, in addition to the 25,000 required each year. Although these figures may not seem large to Western eyes, it should be remembered that the total of households in the Federation is 1,258,561.'

The figures are, indeed, desperately large and out of all proportion to funds available. The Housing Trust has mainly, since 1953 when its full staff was appointed, built low-cost houses for re-sale in outlying parts of towns and in the 'new town' of Petaling Jaya. More recently, after the fire of 1956, it has built, jointly with the municipality, two major housing schemes, including flats and shops, in the heart of Kuala Lumpur; more recently still, it is developing minimum types of houses and, in conjunction with the Forestry Department of the Government, it is designing timber houses which can be mainly built by the purchaser himself, and helping the purchaser to acquire them.

Finally, something must be said about one-family private houses, because these are the playground of Malaya's young architecture. Kuala Lumpur, which is marvellously situated at the foot of the central chain of hills—a kind of Malayan Apennines rising to over 6,500 feet, densely covered with jungle—is surrounded by lower hills, and these are now being covered with the new garden suburbs. The most popular is Kenny Hill, overlooking the high chains and their rocky cave-riddled forehills. The houses here and in similar places are often amusing, endearing even, and brimming with the newest and the best from everywhere.

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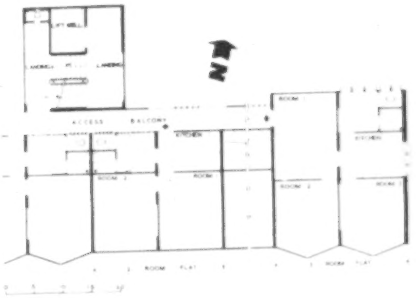
[continued on page 65

MALAYA

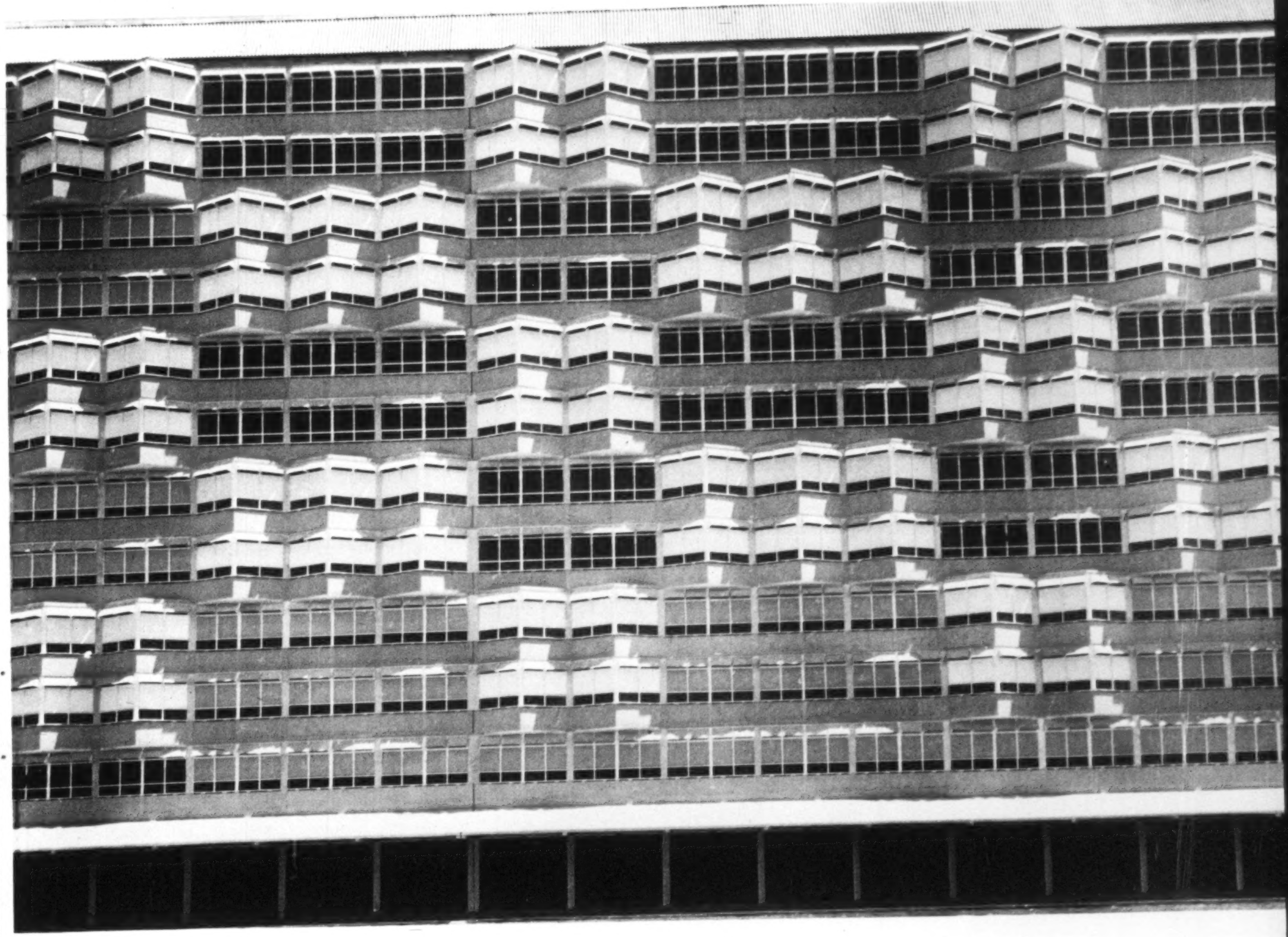
1 and 2. *flats at Kuala Lumpur (architect, R. H. H. Davis, chief architect, Federation of Malaya Housing Trust); part of a large housing scheme for really poor people see plan on right. There are 280 flats in all. The twelve-storey block illustrated is one of two separated by a courtyard. The access balconies face inwards, so that the flats themselves face north in one block and south in the other almost identical aspects only three degrees north of the equator. Construction is a reinforced concrete box-frame with cantilevered galleries. The external façades are enlivened (see 2, below) by projecting groups of two or three windows as triangular bays. The windows are shuttered, with a hooded top section for permanent ventilation. Groups of the shutters are painted in different colours yellow, grey, white and olive green, and the walls behind the access galleries on the other side in dark red. These can be seen in the background of 1, the view approaching Kuala Lumpur down Batu Road.*

1


LIFT WELL
LANDING
LANDING
N
ACCESS BALCONY
KITCHEN
ROOM 2
ROOM
ROOM 1
ROOM 2
KITCHEN
ROOM 1
ROOM FLAT
ROOM FLAT
0 5 10 15 20

plan of typical flats.

2



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[*continued on page 65*

MALAYA

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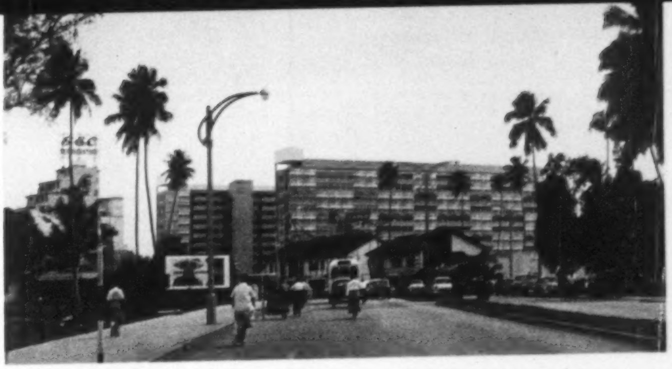
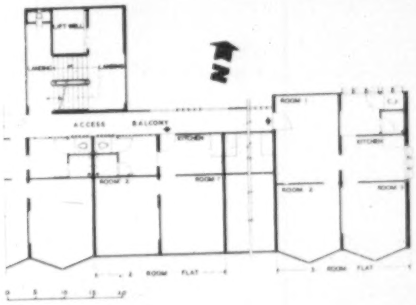
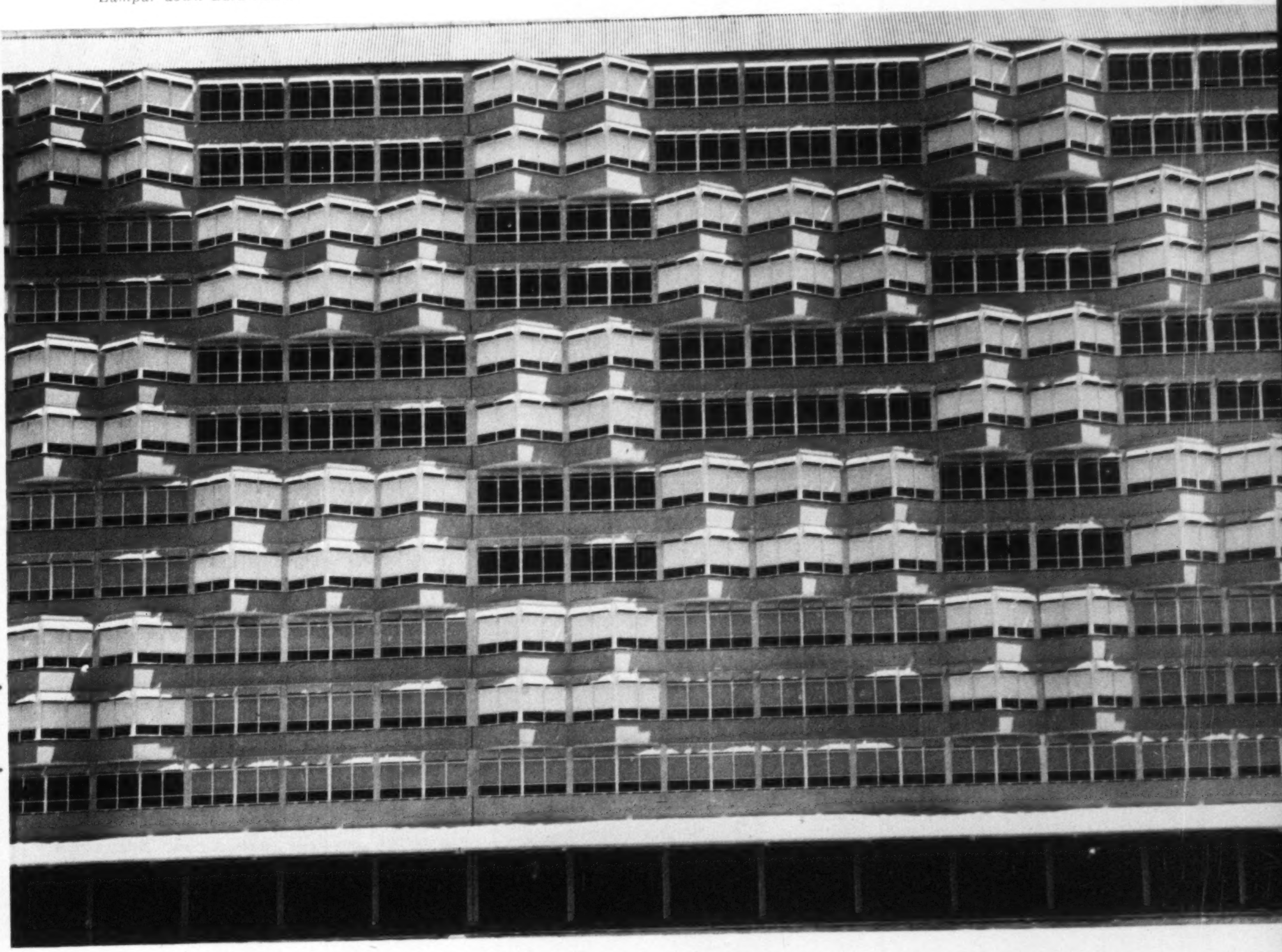
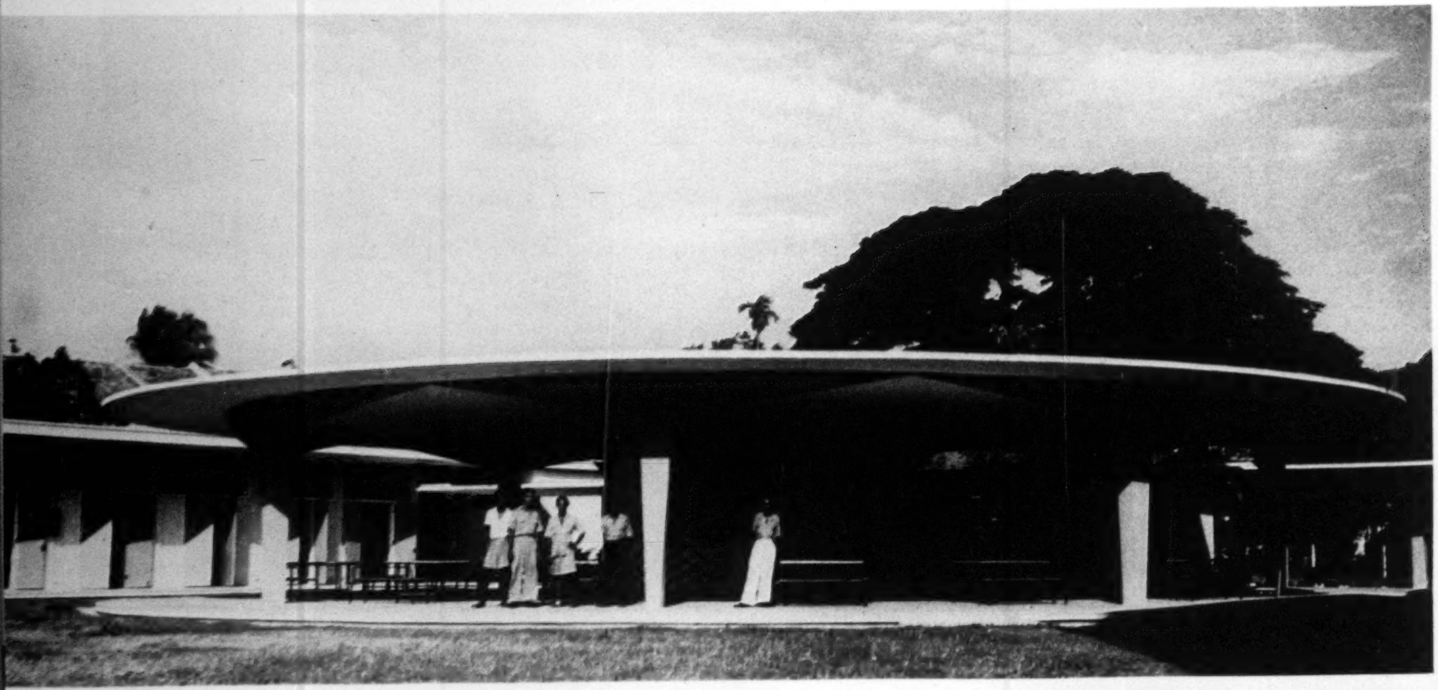

1


LIFT WELL
LANDING
LANDING
N
ACCESS BALCONY
KITCHEN
ROOM 2
ROOM 1
ROOM 1
ROOM 2
KITCHEN
ROOM 1
2 ROOM FLAT
3 ROOM FLAT
0
5
10
15
20

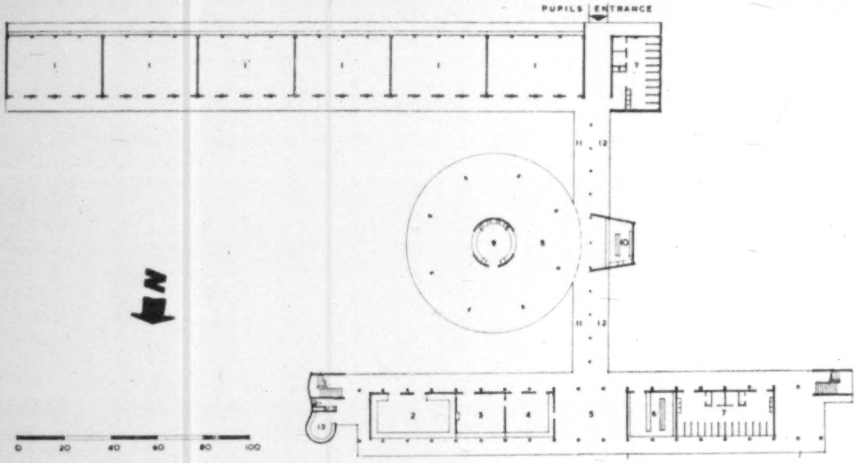
plan of typical flats.

2



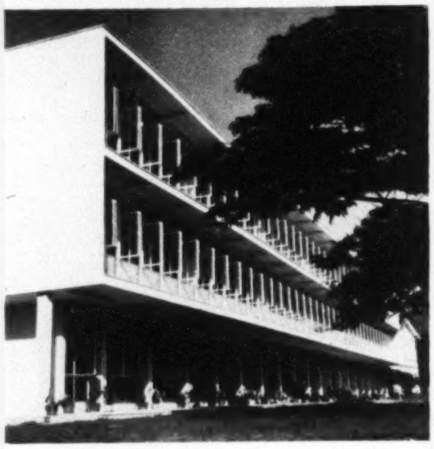


3



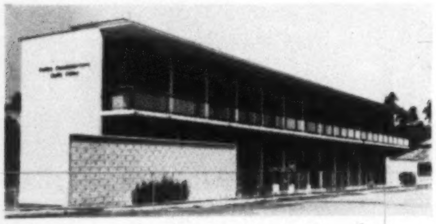
key

1, classrooms.
2, staffroom.
3, principal.
4, clerks.
5, foyer.
6, bookshop.
7, lavatory.
8, canteen.
9, kitchen.
10, tuckshop.
11, covered way.
12, bicycle shed.
13, store.
14, car park.



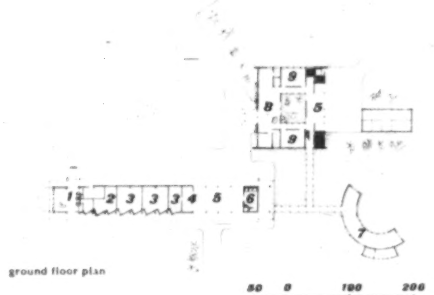
4

3 and 4, girls' school, Penang (architect, W. I. Shipley, Public Works Department, Penang). It consists of a three-storey classroom block with staffrooms on the ground floor, 4, a single-storey classroom block and a circular canteen and tuckshop, 3 above—see plan on left. The buildings are connected by covered ways and are of reinforced concrete. Windows are metal, with coloured glass panels below, backed by built-in furniture.



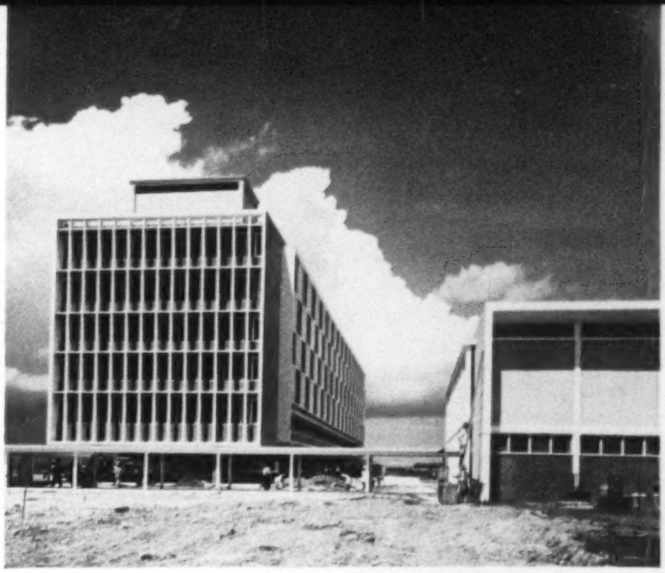
5

5, police-station and district headquarters, Balik Pulau (architect, W. I. Shipley, Public Works Department, Penang): a group comprising a two-storey building (shown in photograph) containing police-station, cells and offices, and single-storey canteen and recreation block, garage block and fire station. The two-storey block is reinforced concrete with window panels of yellow enamelled sheet metal.



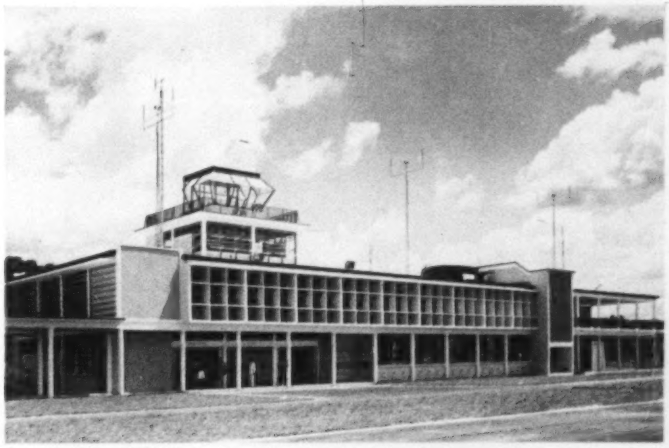
ground floor plan

key
1, office entrance.
2, air-conditioning plant.
3, air-conditioning stores.
4, post office.
5, car port.
6, secondary entrance.
7, canteen.
8, laboratory block entrance and offices.
9, laboratories.



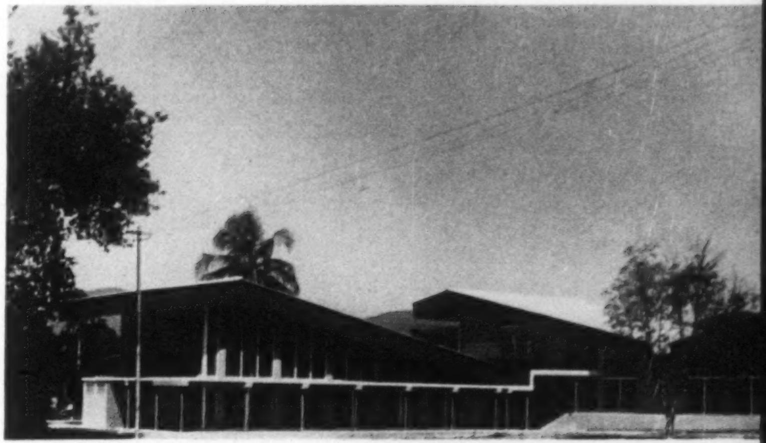
6

6, government offices at Petaling Jaya, the site of a new satellite town planned near Kuala Lumpur (architect, P. S. Merer, succeeded by Howard Ashley, Public Works Department). The main building—a six-storey block—runs north and south. Linked to it by a covered way are a square two-storey chemical research building and a canteen—see plan above. The office block is of reinforced concrete with a 12ft. cantilever on the long sides. These have continuous windows protected by a concrete grille 18in. in front. The short sides have vertical concrete fins to protect the staircase and lavatory windows. The walls are grey mosaic and the window panels red. The building is air-conditioned.



7

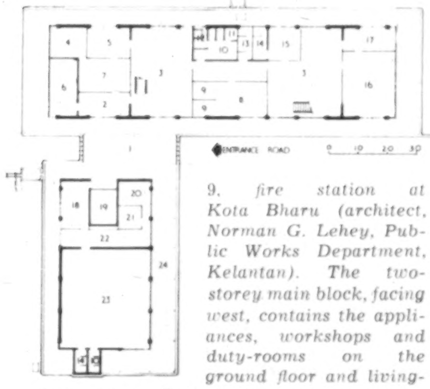
7, terminal building, Kuala Lumpur Airport (architect, P. S. Merer, Public Works Department). Concourse, restaurant, passenger controls and customs are on the ground floor, with offices and a viewing lounge above. At the west end (on the left of the photograph) is another single-storey lounge. The control tower was originally intended to be above the main staircase (right of photograph). The windows are protected by vertical aluminium fins inserted between the members of a continuous concrete frame. The staircase has a blue ceramic grille.

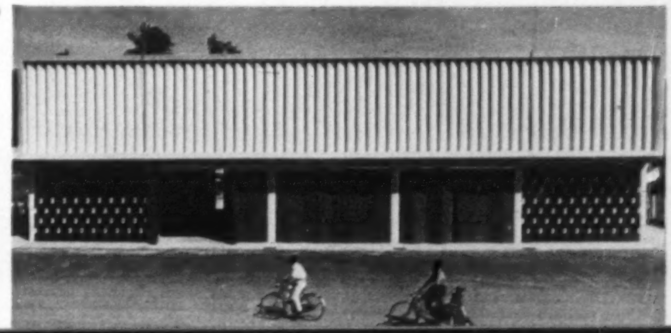


8

8, offices and courthouse at Ipoh, for the Department of Religious Affairs and Malay Custom (architect, P. G. Morley, Public Works Department, Perak)—see plan below. The office building (right of photograph) has a mezzanine floor at either end of a V-shaped roof which slopes inwards to a reinforced concrete gutter wide enough for a cleaner to walk along it. Both buildings have reinforced concrete portal frames of diminishing height; the lower parts of the walls are composed of glazed steel doors pivoted top and bottom, and the upper part of wooden frames with fixed glass louvres for permanent ventilation.

key
1, porch.
2, foyer.
3, general office.
4, mufti and katib.
5, super kathis.
6, canteen.
7, library.
8, missionary.
9, fund section.
10, men's lavatory.
11, store.
12, bath.
13, president's lavatory.
14, women's lavatory.
15, female clerks.
16, president.
17, secretary.
18, appeal committee.
19, witnesses.
20, 21, offices.
22, clerk and registrar.
23, appeal court.
24, covered way.

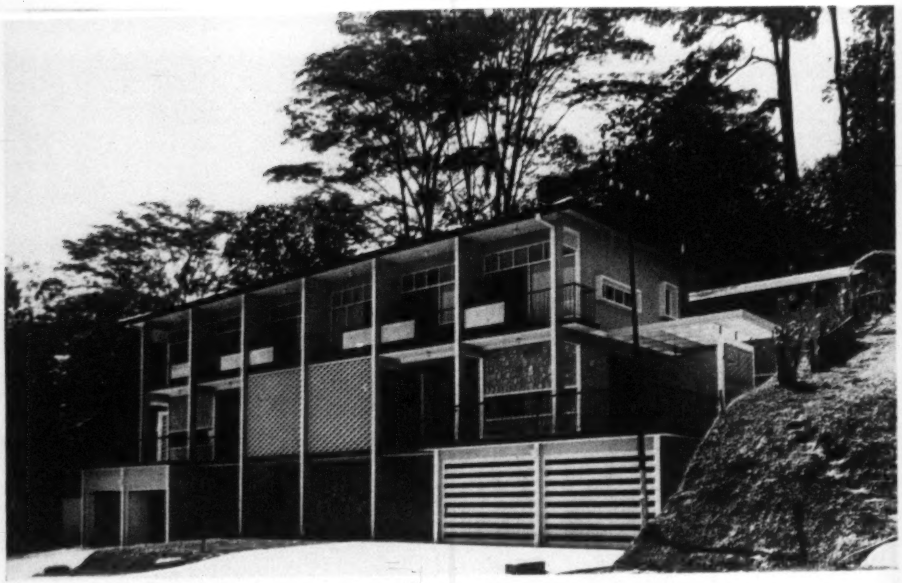




9

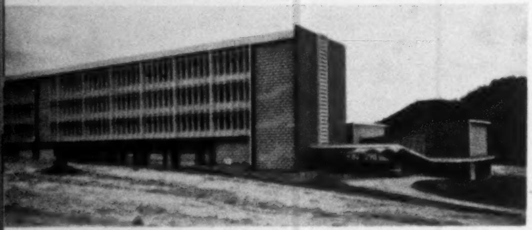
9, fire station at Kota Bharu (architect, Norman G. Lehey, Public Works Department, Kelantan). The two-storey main block, facing west, contains the appliances, workshops and duty-rooms on the ground floor and living-quarters over. Behind is a single-storey instruction and office wing, enclosing a parade and training ground. The living quarters are screened by vertical precast concrete fins, with reinforced concrete beams top and bottom.

MALAYA



10

10, pair of houses, Kuala Lumpur (architect, P. S. Merer of Booty, Edwards and Partners). These are staff houses for the Mercantile Bank. They are entered from a terrace at first-floor level, the ground floor being occupied by garages and existing only at the front owing to the steeply sloping site. The verandah which covers the whole façade is closed in in the centre by a concrete grille to form a porch and is sub-divided vertically to give privacy to the second-floor balconies.



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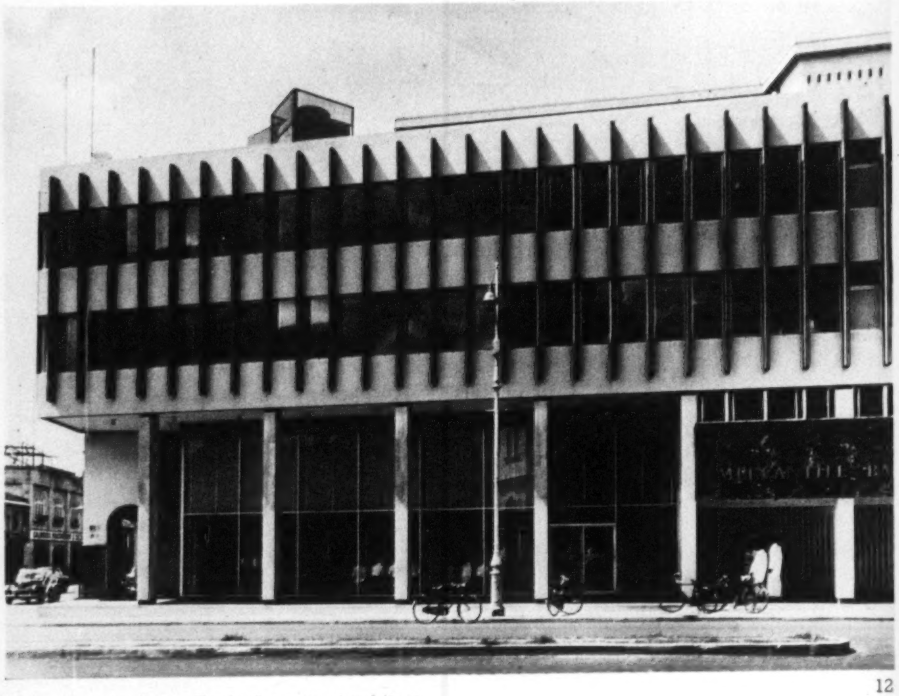
11 (above), arts building, University of Malaya, Kuala Lumpur—the main body of the university being at Singapore (architect, Bill Cheng of Palmer and Turner). The main four-storey block with open ground floor has three lecture-halls behind (on the right in the photograph) linked by covered ways. Concrete grilles protect the windows from the sun.



12

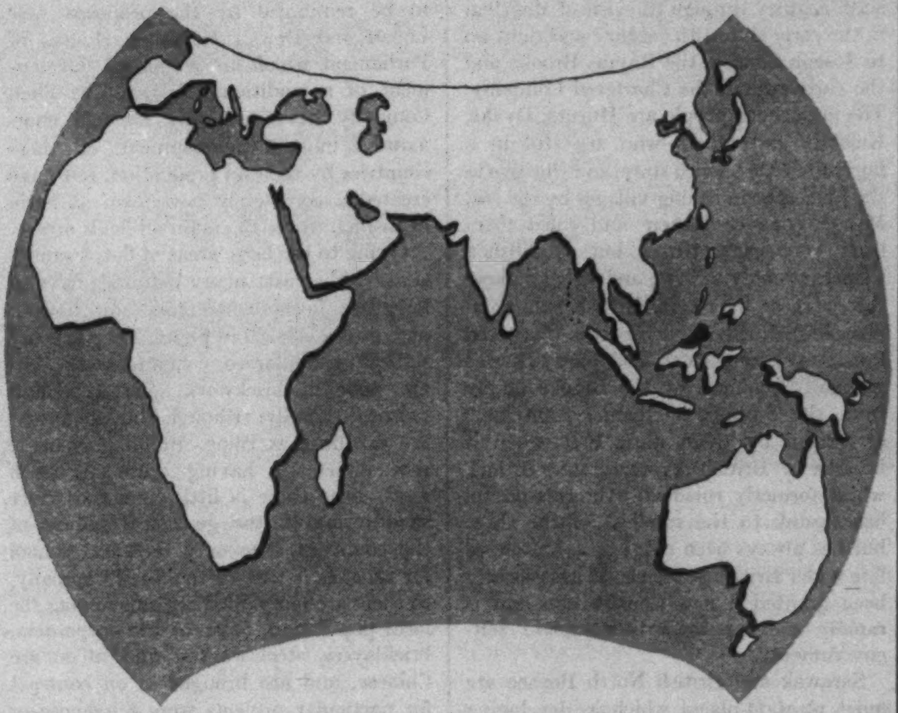
12, bank and offices, Kuala Lumpur (architect, P. S. Merer of Booty, Edwards and Partners): a temporary building to serve between the demolition of the old premises of the Mercantile Bank and the erection of a new larger building by the same architects. It occupies an awkward triangular corner site in Mountbatten Road, in the business centre. The office floors are reached by a circular staircase from the ground-floor bank. The building is concrete framed with exposed diagrid floor-slabs and fixed vertical fins to protect the office windows. It is air-conditioned.

continued from page 60]

the owners believe it and call their house cool—which quite often it is on these windswept slopes—and it would be unfair not to admit that those features, before they became mere decoration, had meaning as protection against sun and glare; and this includes strong colours which are always agreeable here.

However, the predominance of such designs has been challenged in recent years, and all sorts of houses are now going up, from the gaily vulgar to 'architects' austere,' with the majority finding themselves a shelf somewhere between those extremes. Even more promising, there begin to appear among those houses more and more whose designers seem to have given thought to the climate and to deal with it in a less haphazard way.

Lincoln Page



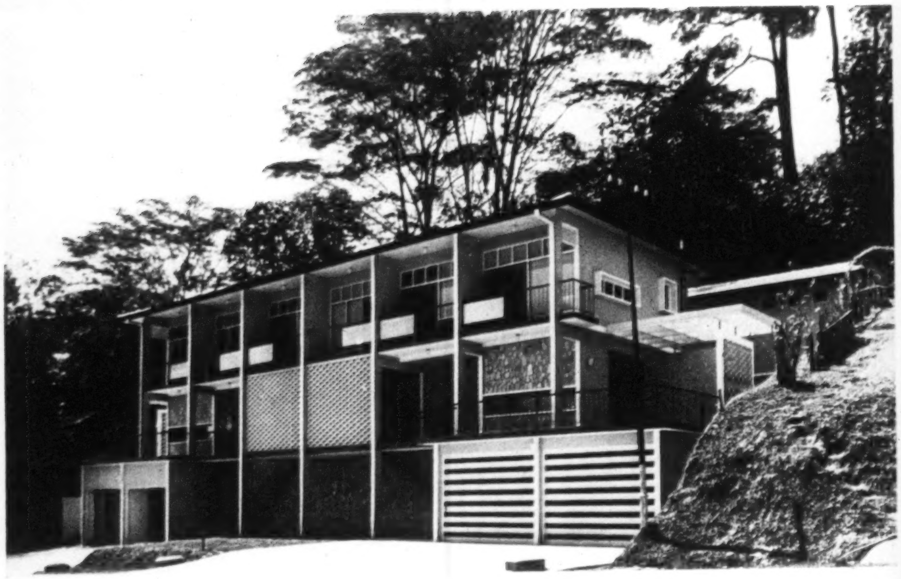
SINGAPORE

Any assessment of recent architecture in Singapore must be made against the background of a fine traditional Palladian idiom, originating in England and exported to India by the East India Company and thence to Singapore when that colony was founded in 1819. The military engineer-officers and architects of the British Army in India, often using pattern books of the classical orders, were quick to see how adaptable the Doric and Tuscan orders were to tropical use. So was evolved what might be called the colonial classic style, with its dignified white façades, buildings one room deep for free air movement, its wide verandahs and footways behind the colonnades, giving shade and protection to the inner walls and sensible louvred openings and hooded windows.

This splendid tradition deserves emphasis because the local understanding of climate upon which it was based has since been lost sight of. Present work shows a good deal of insincerity in design, and while the new tropical architecture of the central Americas and other low latitude territories is entering a brilliant and vital phase, the architects of Singapore seem not to have comprehended the fundamentals of the new approach and have been content to apply the outward forms and elements of the modern movement indiscriminately to their work. We see irritating architectural mannerisms repeatedly used, together with such structural forms as the hyperbolic paraboloid simply because the architect felt he was being 'modern' in using them. There is no recognizable evolution from the past of a contemporary local style. In fact, a sharp break has been made with the past, which is perhaps understandable in a place where influences from East and West converge. Singapore is an entrepôt city through which is channelled the materials and ideas of the world and it is not surprising that the superficialities of an international style should be seized on by this rapidly expanding and cosmopolitan city as an expression of its ambitions.

New European and American materials are everywhere in evidence. The ease with which they are obtained has resulted in the use of all the standard building elements manufactured in those countries so that the office block recently completed on Collyer Quay, Singapore, for instance, would not look out of place in London or New York. The traditional materials were local bricks laid and plastered in lime and sand and roofs covered with palm thatch or locally made Chinese tiles, which gave great character to the building. The latter, unfortunately, have given way to the Marseille pattern tile. Bricks and cement blocks are manufactured in Singapore, cement and steel being imported. Excellent timber from Malaya is available and Chinese labour is capable of a high standard of workmanship.

Life in low latitude territories where the climate is hot and humid is only tolerable when buildings are designed to keep people cool. That is why the early buildings were so successful. In Singapore there is considerable thermal discomfort. Winds which are light and variable cannot be counted on to keep one cool. Air temperatures of 84 deg., with a relative humidity of 85 per cent., are of common occurrence. Design considerations should, therefore, provide for free air movement to prevent the inside temperature rising above the shade temperature. This process is defeated if the air is allowed to move across hot surfaces like the tops of concrete roofs and areas of paving, thereby heating it up before it enters the building. Large openings are needed to give the greatest benefit on those days when there is only a slight breeze. Buildings should be orientated to take advantage of the prevailing winds and to minimize the effect of the sun, which is most intense on the east and west. It is desirable to expose as little wall surface as possible to these points of the compass and to protect exposed walls by shading and projections. All openings must have protection from the sun, glare and driving rain in the form of canopies, verandahs and various kinds of louvred sun-breaker. The latter offer some degree of protection at the same time as admitting air. Permanent openings are necessary at ceiling and floor level and the roof space should be well ventilated and insulated. All surfaces should be light



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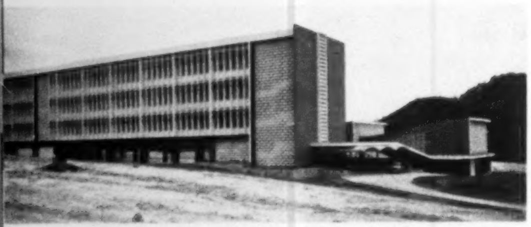

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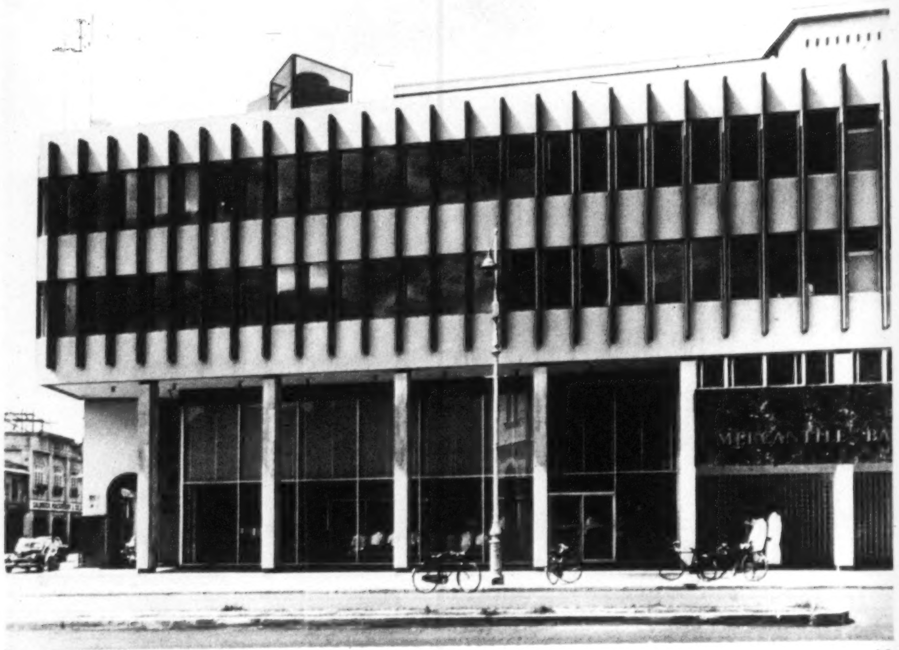

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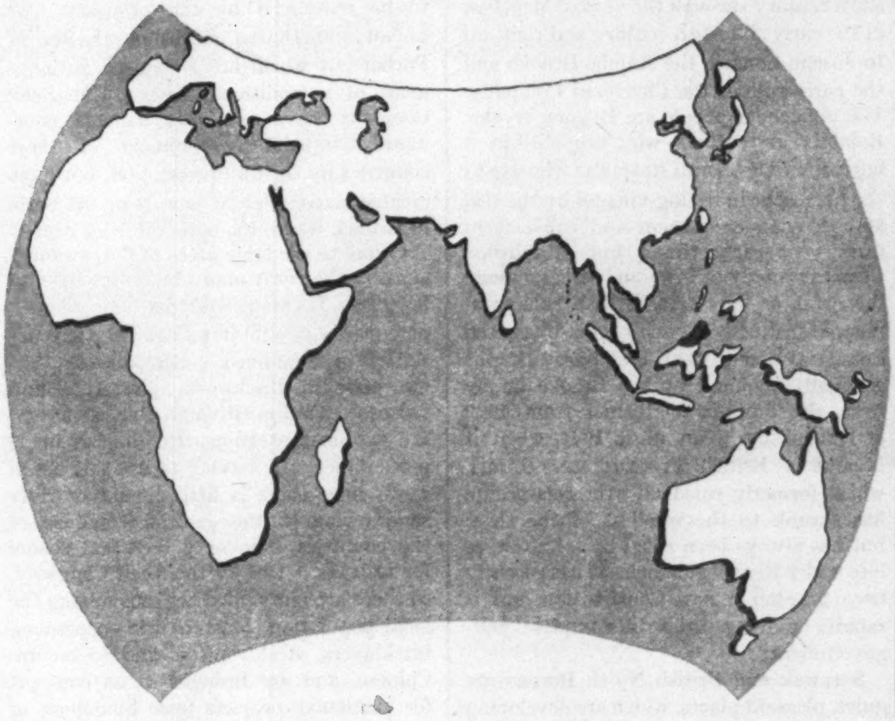

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These are stringent requirements, and the success of the designs have depended on the degree to which the architect has satisfied them. Unfortunately, they are often neglected or, if considered, misapplied. The sun-breaker, for instance, is used in a clumsy and unscientific way—the device is not fully understood. From the point of view of the people who have to live and work in these buildings, there is much cause for complaint. Large areas of glass are exposed to the sun, thereby intensifying heat and glare and subsequent steps have to be taken to combat this with blinds, hoods, fans, air-conditioning and other means. The need to allow for maximum air movement is overlooked, as can be seen by the absence of permanent ventilation at ceiling and floor level and by the use of fenestration copied from European examples and therefore unsuitable for the tropics.

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To bring about an improvement in the standard of design, architectural education of a liberal kind will have to be instituted as a first step. Some progress in this direction had already been made, but the new self-governing state has suppressed this to the detriment of architectural progress. It is to be hoped that the folly of this step will soon be realized. Ultimately, it is the integrity and vision of the architect and his response to the conditions for which he is designing which will enable modern Singapore architecture to bring about a significant contribution to the contemporary scene.

Peter Morley

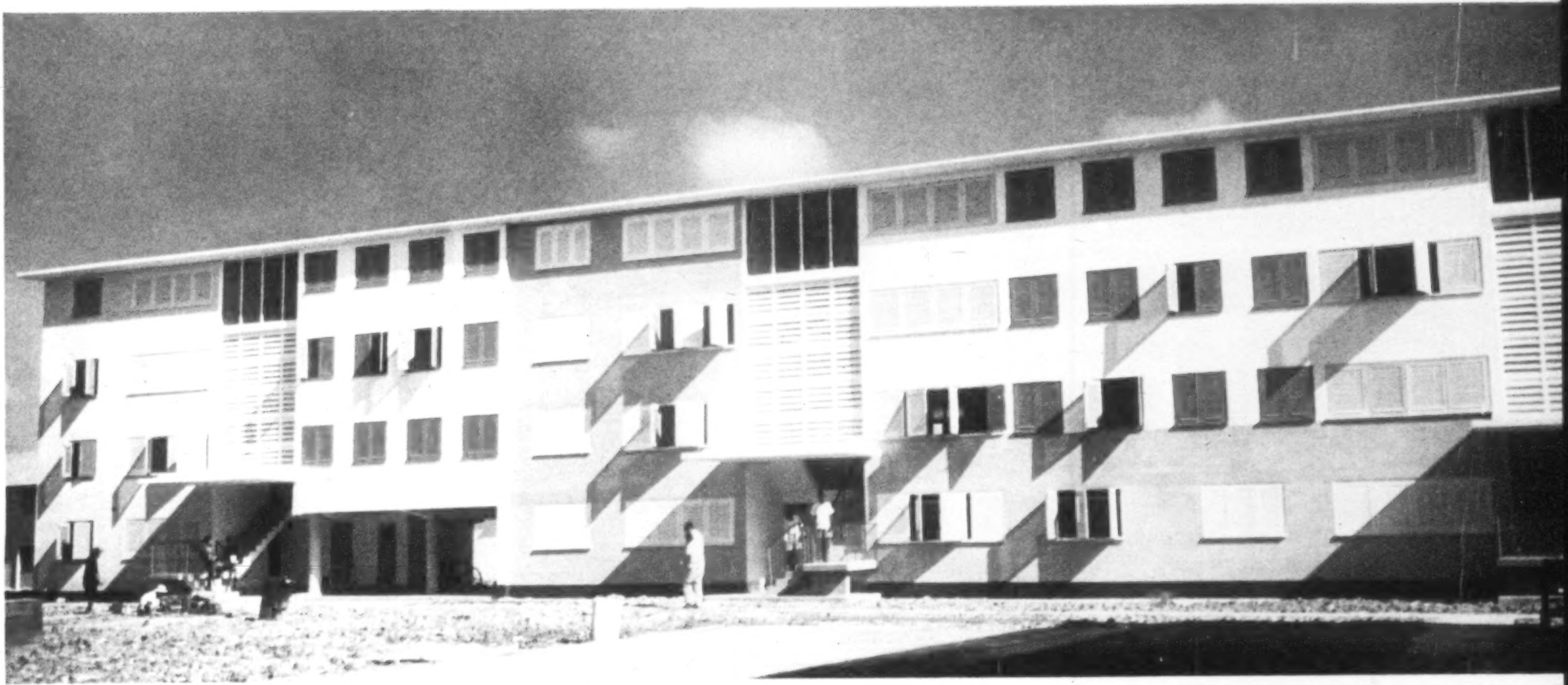
BRUNEI, SARAWAK AND NORTH BORNEO

These three territories have an ancient history of trading in spices, camphor and gold, of conquest by Malay sultans, of piracy and general adventure ranging from visits by Chinese merchants in the sixth century through the visit of Magellan in the early sixteenth century and right up to Joseph Conrad, the Rajahs Brooke and the early rule of the Chartered Company. The indigenous people are Muruts, Dyaks, Kelabits and others who are still in a fairly underdeveloped state, and who live in the jungles or in fishing-villages by the sea. Malays conquered them and ruled them from very early times, but established themselves only in town and villages along the coast or by rivers. British rule commenced in North Borneo by the Chartered Company about 1870, and Sarawak was gradually acquired by the Brooke family from the Sultans of Brunei from 1839 and ruled by them until 1946 when it became a British Protectorate. Brunei, which formerly ruled all over this group, has shrunk to the smallest of the three but has always been ruled by a Sultan, of late under British guidance. It has recently been granted a new Constitution and is rapidly moving towards complete self-government.

Sarawak and British North Borneo are quiet, pleasant places, which are developing slowly on a good stable basis. Towns are growing, industry and agriculture are being developed and there is every reason for the inhabitants to look to a steady and fairly prosperous future. Most of the towns were razed by one side or the other in the last war but have since been rebuilt to unexciting but sensible straightforward plans. The State of Brunei has a totally different post-war history. It too was devastated during the war, but the enormous increase in the production of oil by the Brunei Shell Petroleum Company has led to a very rapid rebuilding of the towns. There has unfortunately been no town-plan, and a great opportunity was lost when a whole town sprang up with many good modern buildings, both private and government, which had little relationship to each other. Large parts of the original river town, consisting of wooden and thatched buildings on stilts, remain however. Many such surround the new mosque, which was one of the first post-war buildings to be started, built to a basically traditional design as required by the Sultan. It provides a focal point in the town (which is built on flat land), a focal point soon to be reinforced by the proposed new Lapau and Dewan Majlis or Houses of Parliament which are a modern development of a traditional design. The Shell Company have not only assisted enormously in the development of these countries by their oil production, but have created a completely new town at Seria in Brunei, where the main oil fields are.

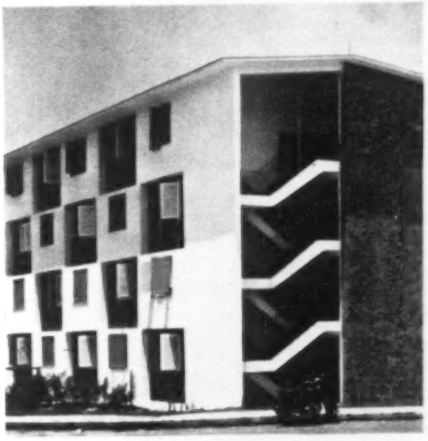
Owing to the large areas of flat, swampy land by the coast many buildings have to be piled. Local contractors now have a high degree of skill in piling. They also are skilled in reinforced concrete work, but are poor in brickwork, plastering and finishes generally, although Chinese masons are excellent at tiling. Building is made more difficult by having to use salt beach sand, since there is little inland or river sand owing to the geological nature of the countries. The only technical school for artisans is run by the Shell Company, so there are few skilled artisans among the local population. Most of the carpenters, bricklayers, steel workers and so on are Chinese, and are brought in on contract for particular projects from Singapore or Hong Kong.

The problems of building in this climate are now well known. Heat and humidity are the main things to overcome and, if it is to be done by natural means, this involves basic one-room-deep buildings with the maximum cross ventilation and the use of ceiling fans. This then raises the problem of wind control, so some form of adjustable louvre is generally used in windows. The advantages of complete air conditioning of buildings are now being recognized and many new projects are being so treated. The additional expense is, of course, generally not great since the cube of the buildings can be reduced. Roofs, pitched or flat, must be insulated and sun and rain must be kept from walls and windows. This is achieved traditionally by overhanging eaves or open verandahs, but a variety of adjustable or fixed brise soleils, screen walls and so on are now also used.



1

1 (above), housing on the Princess Estate, Queenstown (architect, P. R. Davison, Singapore Improvement Trust): planned in four-storey blocks with variety given to the façades by changes in the colour and texture of walls and window-shutters; load-bearing cross-wall construction, using hollow blocks for thermal insulation.



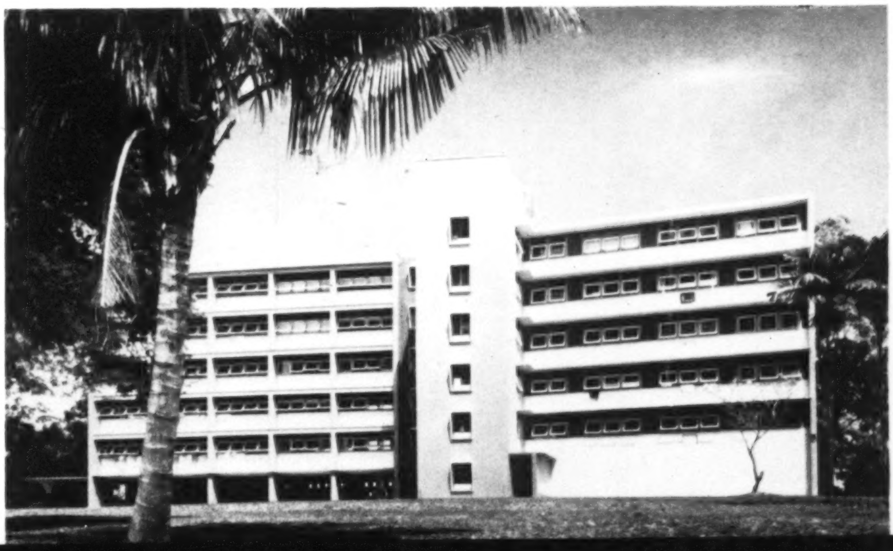
2

2 (right), housing at Queenstown (architect, Lincoln Page, Singapore Improvement Trust): balcony access with semi-enclosed stair at each end. The recessed panels on the façade (which are coloured deep blue) arise from the variation in room-depth required by bathrooms and kitchens. These are opposite handed on alternate floors to give the chequer effect.

3

3 (above), housing at Tiong Bahru (architect, Lincoln Page, Singapore Improvement Trust). There are six flats to each stair and shops on the ground floor. Construction is a reinforced concrete frame with cement block infill walls, rendered brick-red on the main façade with surrounds in white.

4



4 (below), flats for senior Government officers (architect, M. J. Cotton, Public Works Department). They have either two or three bedrooms, with lift and staircase access. The open part of the ground floor provides a children's covered play-space. Construction is reinforced concrete.

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To bring about an improvement in the standard of design, architectural education of a liberal kind will have to be instituted as a first step. Some progress in this direction had already been made, but the new self-governing state has suppressed this to the detriment of architectural progress. It is to be hoped that the folly of this step will soon be realized. Ultimately, it is the integrity and vision of the architect and his response to the conditions for which he is designing which will enable modern Singapore architecture to bring about a significant contribution to the contemporary scene.

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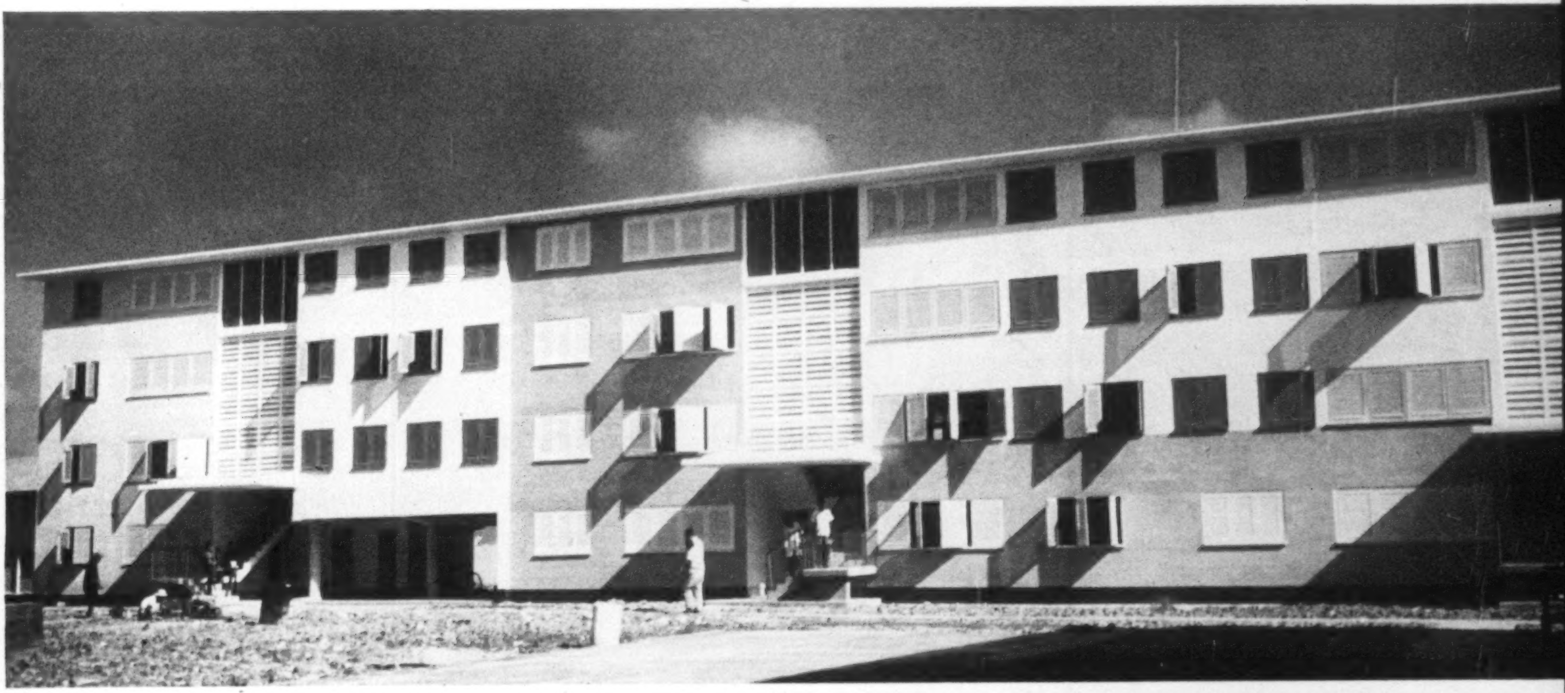
Sarawak and British North Borneo are quiet, pleasant places, which are developing slowly on a good stable basis. Towns are growing, industry and agriculture are being developed and there is every reason for the inhabitants to look to a steady and fairly prosperous future. Most of the towns were razed by one side or the other in the last war but have since been rebuilt to unexciting but sensible straightforward plans. The State of Brunei has a totally different post-war history. It too was devastated during the war, but the enormous increase in the production of oil by the Brunei Shell Petroleum Company has led to a very rapid rebuilding of the towns. There has unfortunately been no town-plan, and a great opportunity was lost when a whole town sprang up with many good modern buildings, both private and government, which had little relationship to each other. Large parts of the original river town, consisting of wooden and thatched buildings on stilts, remain however. Many such surround the new mosque, which was one of the first post-war buildings to be started, built to a basically traditional design as required by the Sultan. It provides a focal point in the town (which is built on flat land), a focal point soon to be reinforced by the proposed new Lapau and Dewan Majlis or Houses of Parliament which are a modern development of a traditional design. The Shell Company have not only assisted enormously in the development of these countries by their oil production, but have created a completely new town at Seria in Brunei, where the main oil fields are.

Owing to the large areas of flat, swampy land by the coast many buildings have to be piled. Local contractors now have a high degree of skill in piling. They also are skilled in reinforced concrete work, but are poor in brickwork, plastering and finishes generally, although Chinese masons are excellent at tiling. Building is made more difficult by having to use salt beach sand, since there is little inland or river sand owing to the geological nature of the countries. The only technical school for artisans is run by the Shell Company, so there are few skilled artisans among the local population. Most of the carpenters, bricklayers, steel workers and so on are Chinese, and are brought in on contract for particular projects from Singapore or Hong Kong.

The problems of building in this climate are now well known. Heat and humidity are the main things to overcome and, if it is to be done by natural means, this involves basic one-room-deep buildings with the maximum cross ventilation and the use of ceiling fans. This then raises the problem of wind control, so some form of adjustable louvre is generally used in windows. The advantages of complete air conditioning of buildings are now being recognized and many new projects are being so treated. The additional expense is, of course, generally not great since the cube of the buildings can be reduced. Roofs, pitched or flat, must be insulated and sun and rain must be kept from walls and windows. This is achieved traditionally by overhanging eaves or open verandahs, but a variety of adjustable or fixed brise soleils, screen walls and so on are now also used.

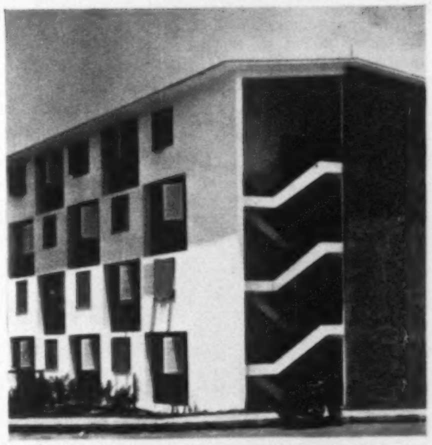
SINGAPORE



1

1 (above), housing on the Princess Estate, Queenstown (architect, P. R. Davison, Singapore Improvement Trust): planned in four-storey blocks with variety given to the façades by changes in the colour and texture of walls and window-shutters—load-bearing cross-wall construction, using hollow blocks for thermal insulation.

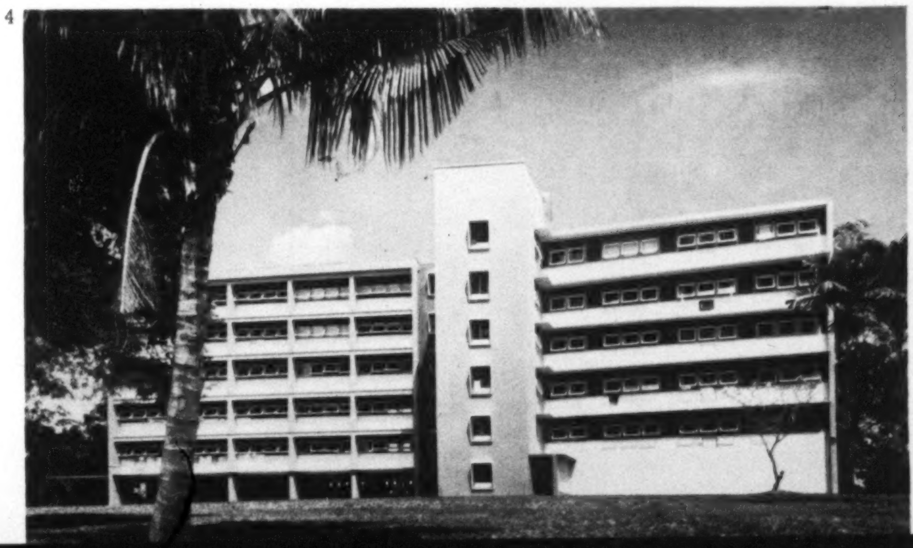
2 (right), housing at Queenstown (architect, Lincoln Page, Singapore Improvement Trust): balcony access with semi-enclosed stair at each end. The recessed panels on the façade (which are coloured deep blue) arise from the variation in room-depth required by bathrooms and kitchens. These are opposite handed on alternate floors to give the chequer effect.

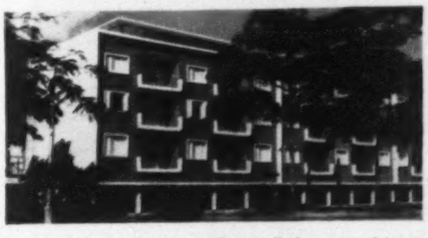


2

4 (below), flats for senior Government officers (architect, M. J. Cotton, Public Works Department). They have either two or three bedrooms, with lift and staircase access. The open part of the ground floor provides a children's covered play-space. Construction is reinforced concrete.

4

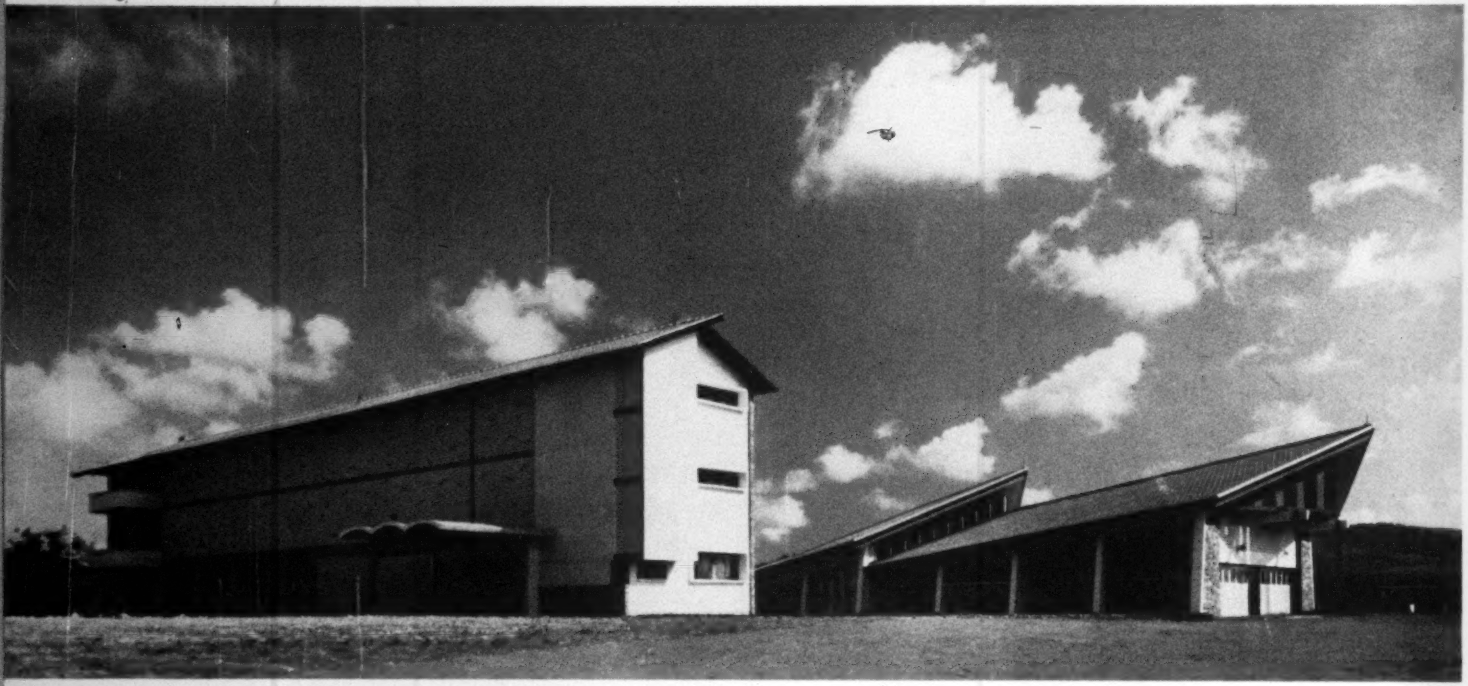




3

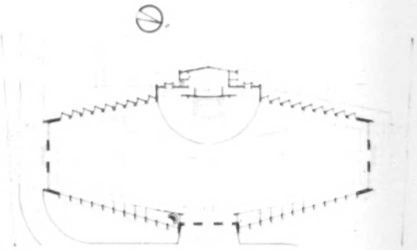
3 (above), housing at Tiong Bahru (architect, Lincoln Page, Singapore Improvement Trust). There are six flats to each stair and shops on the ground floor. Construction is a reinforced concrete frame with cement block infill walls, rendered brick-red on the main façade with surrounds in white.

5

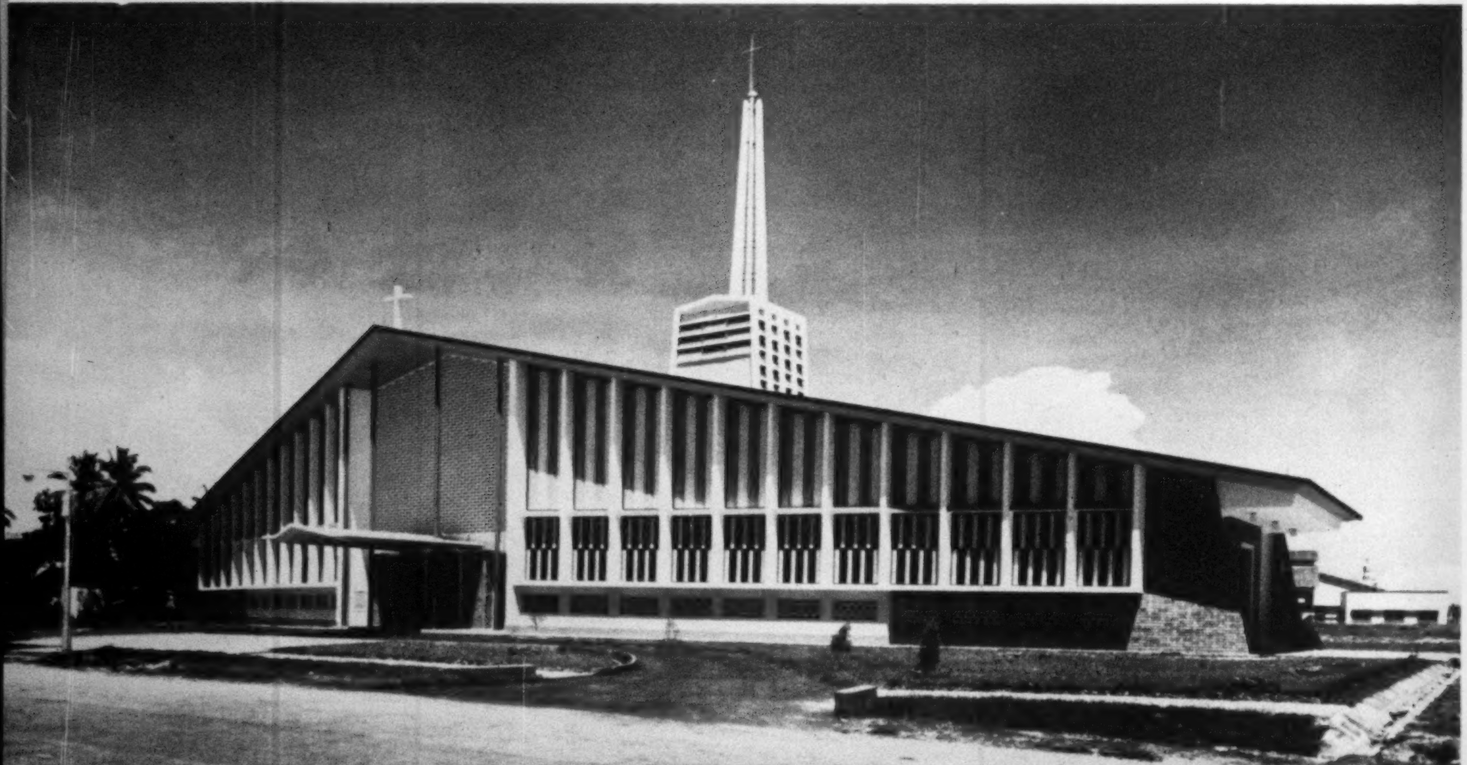


5 (above), *St. Anthony's Friary (architect, Alfred Wong): for the Franciscan Fathers. The site is about 15 miles from Singapore city with wide views of the surrounding countryside. The main building (on left of photograph) has the refectory, workroom and reception-rooms on the ground floor and fourteen bedrooms above. It is connected by a covered way to the chapel (right in photograph), which has roofs at two levels, forming a clerestory that admits light to the altar. Construction is reinforced concrete with tiled timber roofs.*

6 (below), *Roman Catholic church (architect, Alfred Wong)—dedicated to St. Bernadette. It seats 1,200 and has reinforced concrete columns and steel beams, exposed internally, supporting a light steel deck roof. There is a choir balcony over the main entrance. Bells are housed in the small tower below the flèche—plan on right.*



6



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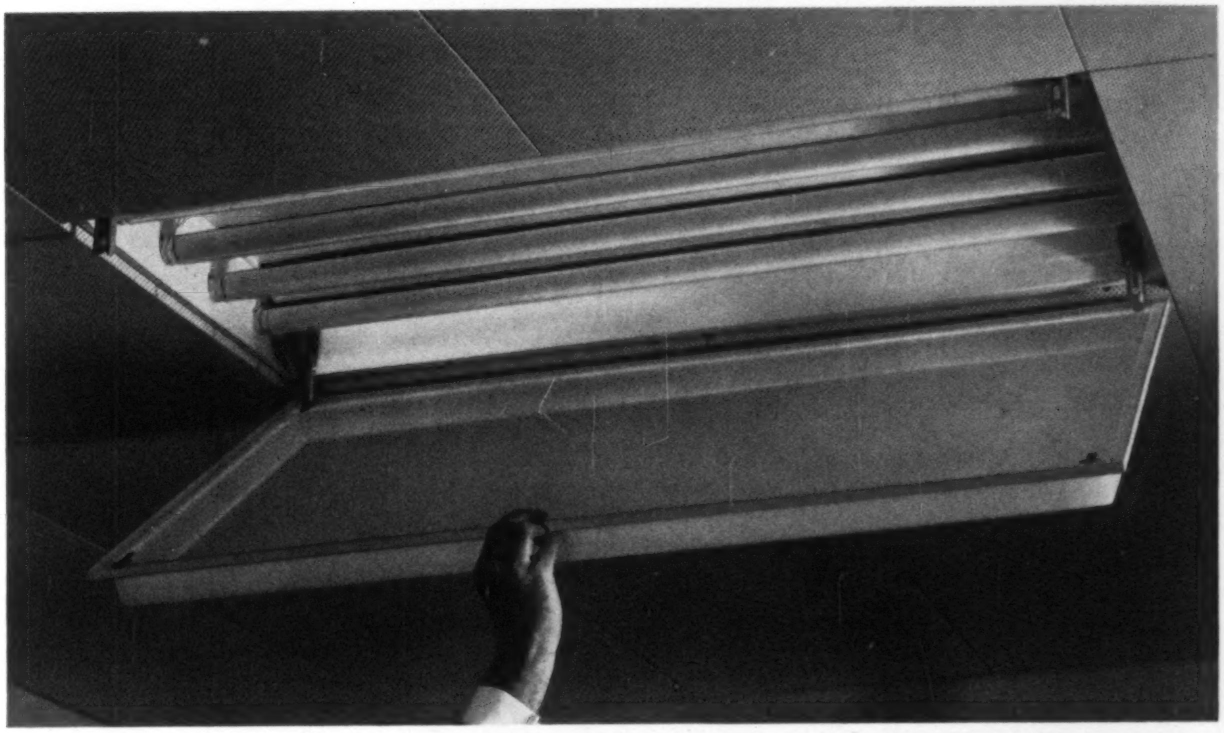

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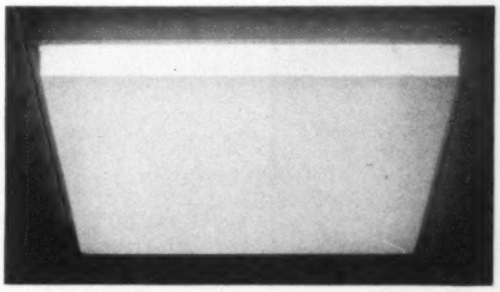

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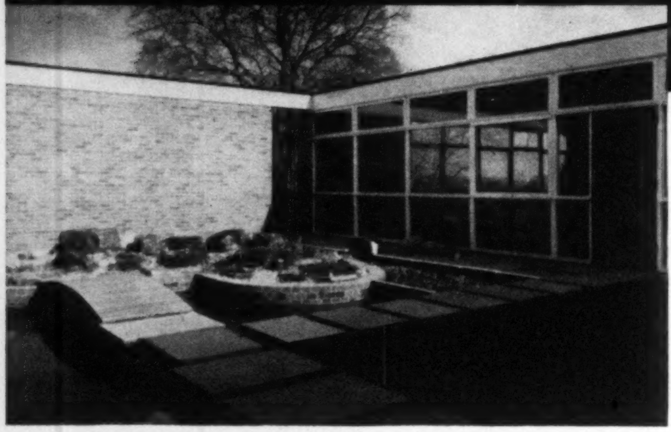

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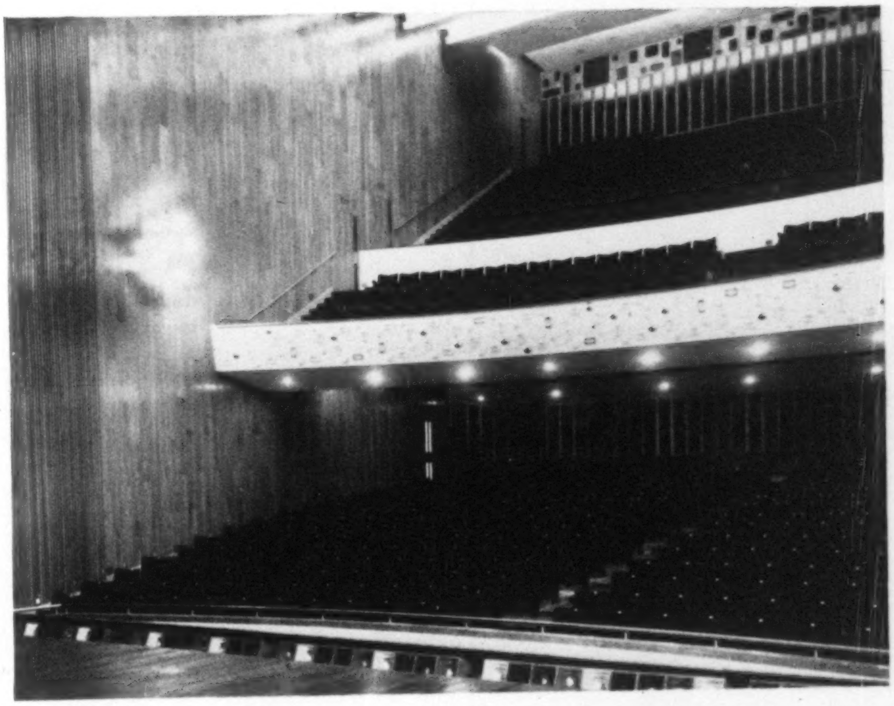
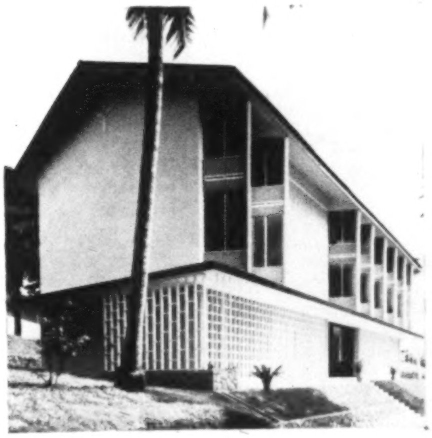
7, Victoria Theatre (architects, James Cubitt, Leonard Manasseh and Partners): the internal reconstruction of a theatre of 1896 within the original walls. The air-conditioned main auditorium has 950 seats and is designed for use as a theatre, cinema and concert-hall and for public meetings. There are also a rehearsal theatre seating 150, a large foyer, four bars and dressing-rooms for 75.



7

8 (below), St. Peter's Hall, a residential college for Anglican students (architects, E. E. Keen and Partners). Accommodation includes chapel, refectory, library, common-room, three small flats for married students and fifteen rooms for single students. The site slopes steeply, but a level platform was left by the demolition of an earlier building. This produced an east-west orientation for the main frontages; hence the angled windows to protect rooms from the morning and afternoon sun. Construction is reinforced concrete with brick infill walls and a timber roof.



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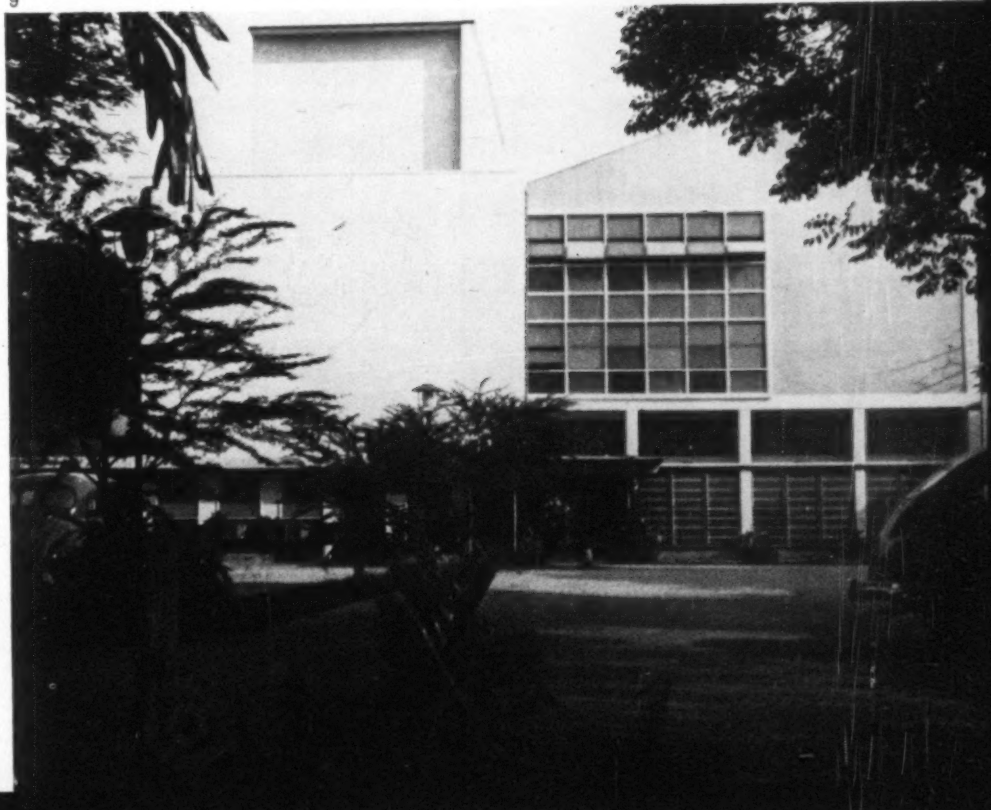
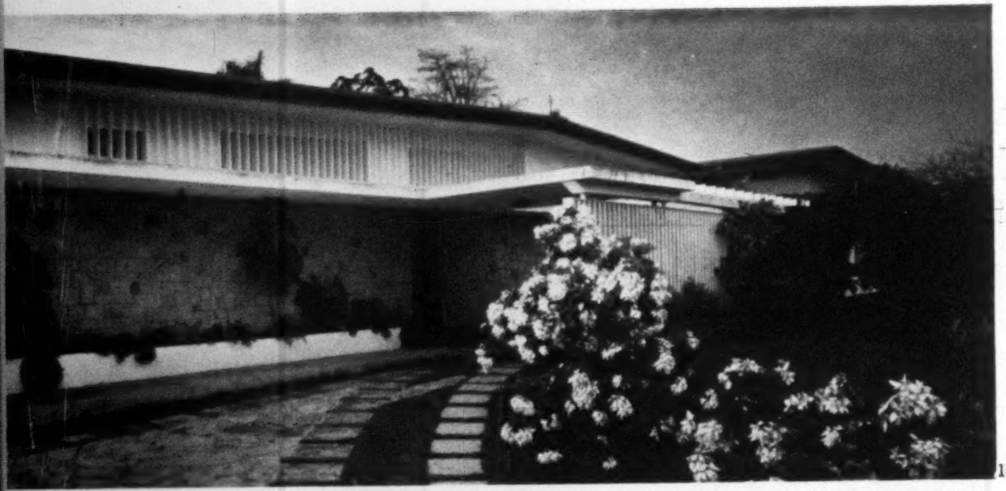
9



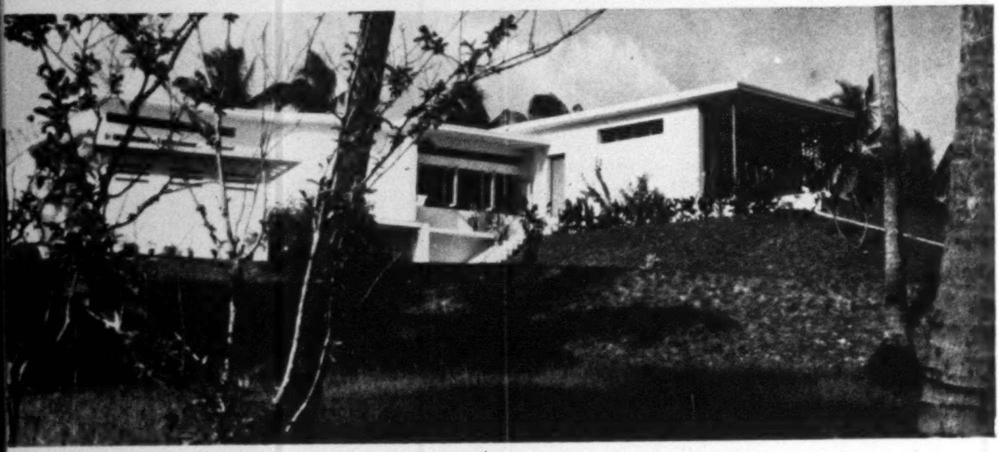
9 (right), Government adult education centre (architect, M. J. Cotton, Public Works Department). The building contains an air-conditioned theatre seating 350 people with a full stage. The theatre is at the upper level, and below it are study-rooms, offices and a bar. Construction is reinforced concrete.

SINGAPORE



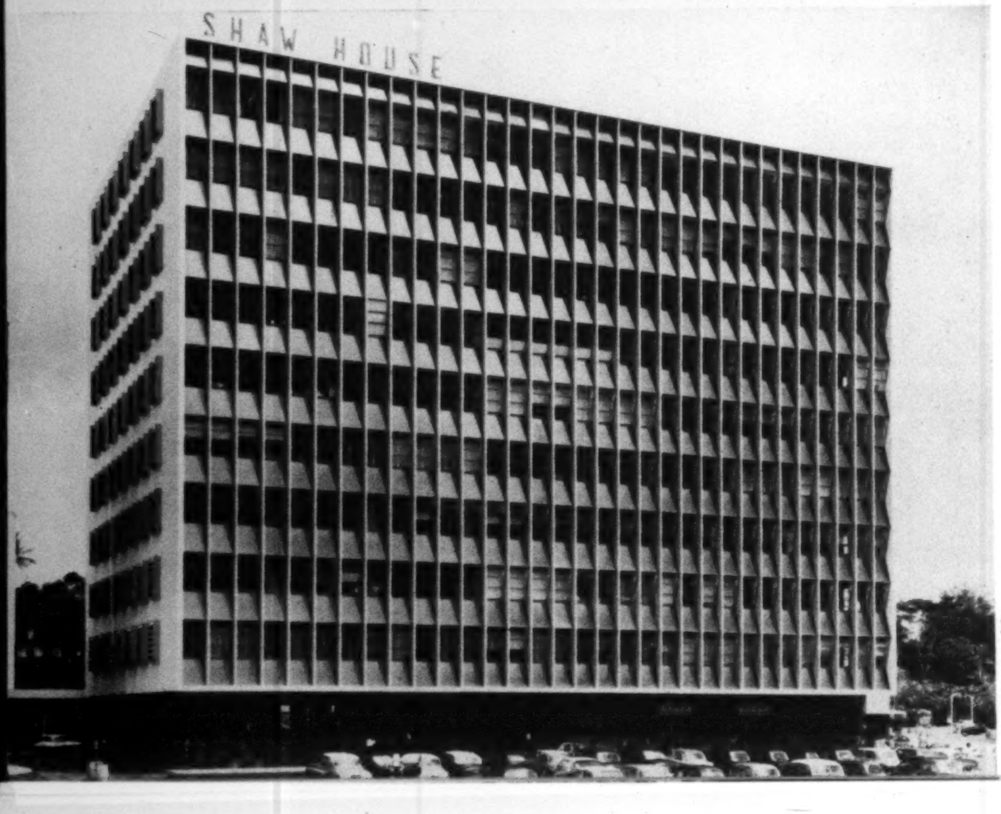
10

10, house at Belmont (architects, James W. Ferrier and Partners): on a suburban site and with the main interest on the garden side, shown in the photograph. The living and dining room on a lower level are connected with the bedroom wing, which overlooks a private courtyard, by a bridge across a garden pool.

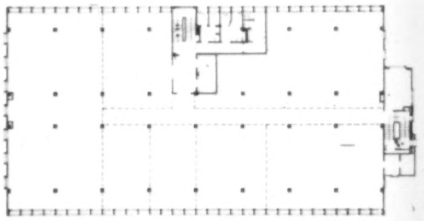


11

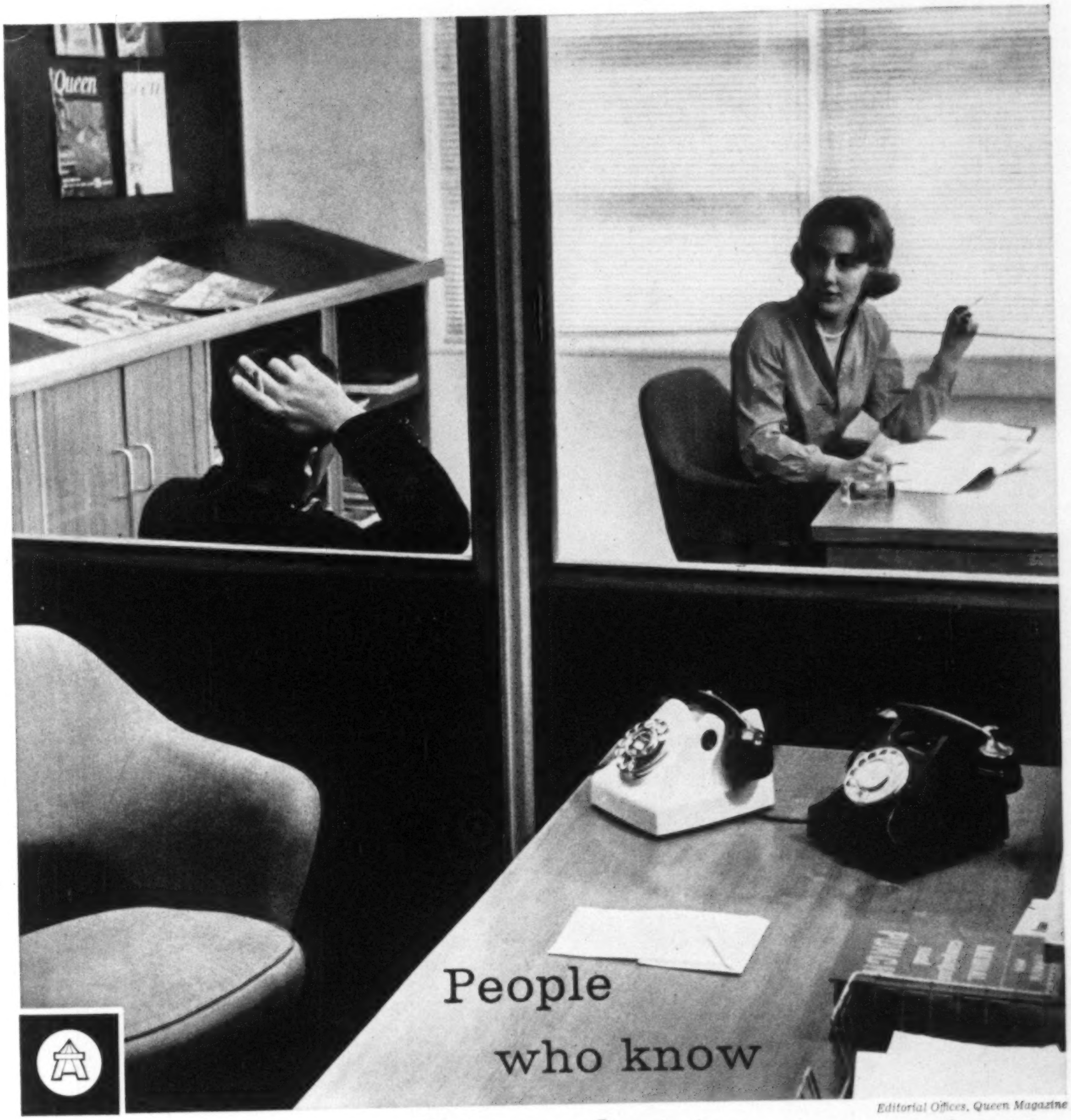
11, senior officers' quarters, Kay Siang Road (architect, Lincoln Page, Singapore Improvement Trust): planned with changing levels, determined by the slope of the site. The lowest level has the garage, main entrance, stores and servants' rooms. Steps from this level lead to a central lounge that separates feeding from living areas, and a few more steps lead to the bedroom and bathroom wing which runs at right angles to the lower part of the building (on the right in the photograph). Load-bearing walls are of hollow blocks.



12



12, office building (architects, van Sitteren and Partners), incorporating a cinema. The office floors are designed for easy sub-division for letting and each floor is separately air-conditioned. Construction is reinforced concrete, with dark green marble facing on the ground floor and white bush-hammered plaster above. The fins are faced with yellow glass mosaic and the windows on the main (west) façade have asbestos louvres. On the north and south façades they are angled to give protection from the sun. The steel windows are locally made.



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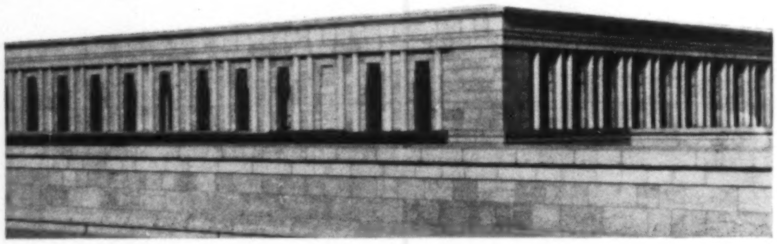

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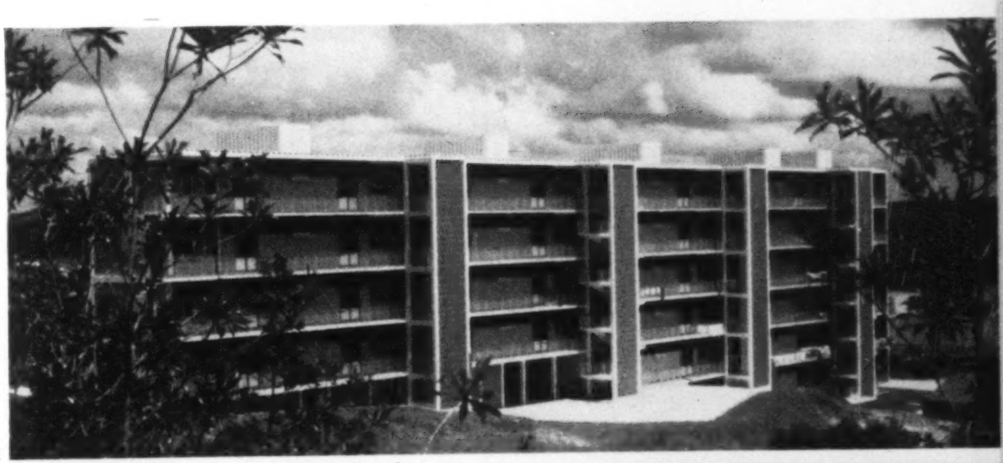
BRUNEI

1, *flats at Tasek (architect, J. Bailey): a rectangular block built across the contours of a sloping site, so that there are six storeys at one end and four at the other. The building contains 50 flats altogether, each with a living-room facing south and two bedrooms facing north. The photograph shows the south side with projecting staircase-towers and access balconies.*

1


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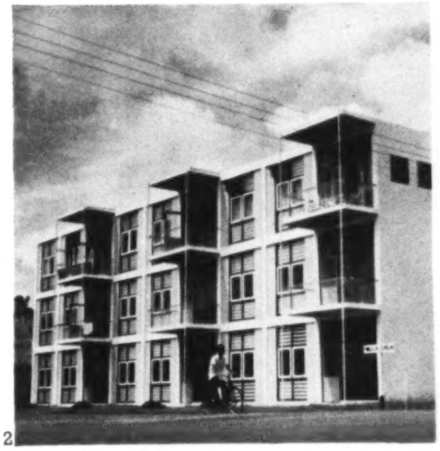
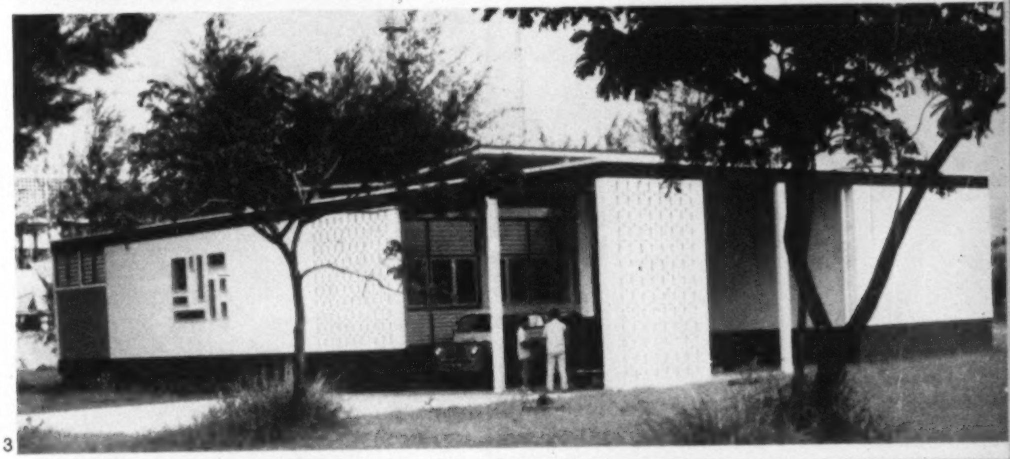


2 *(above), flats in Brunei town (architects, Booty, Edwards and Partners): a three-storey block with covered balconies the full width of each living-room. Access is by a semi-open staircase at the end of the block. Construction is reinforced concrete.*

3


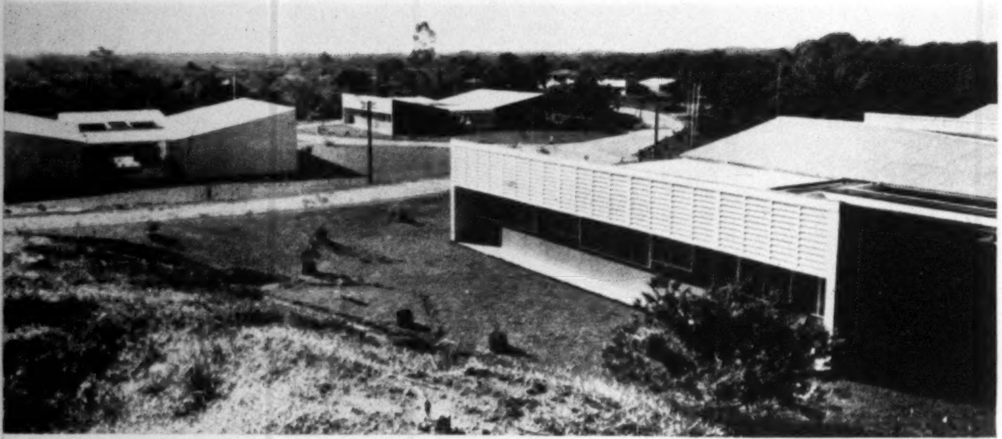
3 *(above right), broadcasting studios, Kuala Belait (architects, James Cubitt, Leonard Manasseh and Partners). Contains studios, library, offices, control-rooms and waiting-space, all air-conditioned, planned round small garden courts. Construction is reinforced concrete. The building is raised in the centre to give clerestory lighting and ventilation.*

4 *(right), Government offices, etc., Kuala Belait (architects, Booty, Edwards and Partners): a group of buildings including offices, post-office and court-house. The main office block is on the right in the photograph, with the octagonal post-office in the background. The structure, including piling, is reinforced concrete. All windows, doors and sun-breakers are of anodized aluminium because of the highly corrosive salt atmosphere.*

4

BRUNEI

5



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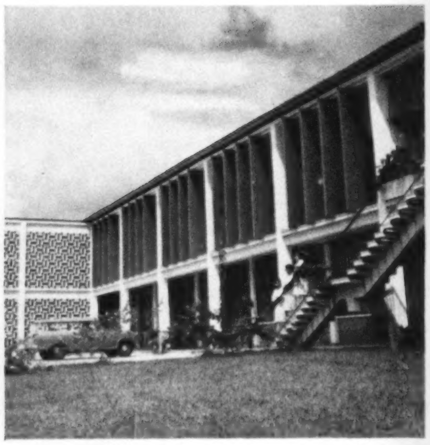
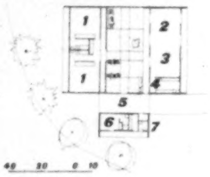


5, senior Government officers' quarters (architects, Public Works Department, Brunei): a group of identical single-storey houses, each with living-rooms and bedrooms separated by a courtyard—plan of individual house on right. The two wings of each house are linked by a trellis. They have load-bearing cavity end walls. The side walls, facing both inwards and outwards, are all window or louvred panels.



ground floor plan, officers' quarters

key

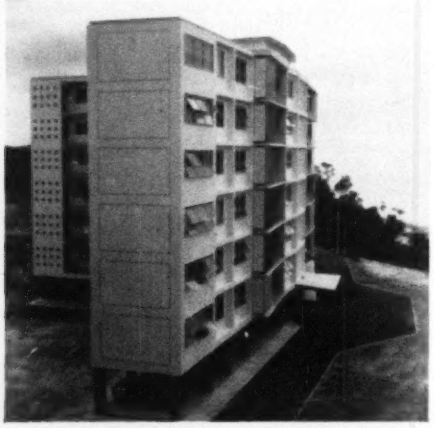
1, bedrooms.
2, living area.
3, dining area.
4, kitchen.
5, garage.
6, servants.
7, laundry.

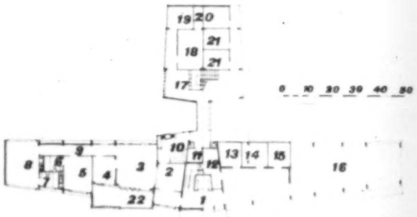
6, girls' school, Brunei town (architects, Booty, Edwards and Partners): a two-storey building planned round an open court, with sun-screening either by means of vertical fins (right of photograph) or decorative concrete grilles (on the left). Construction is reinforced concrete with brick infill panels and timber roofs. The roofs are covered with glazed tiles.

NORTH BORNEO

7, flats at Signal Hill, Jesselton (architects, Palmer and Turner): twelve two- or three-bedroom flats with servants' quarters additional, planned in two linked blocks at right-angles—see plan, far right. Construction is reinforced concrete with brick infill panels.

7

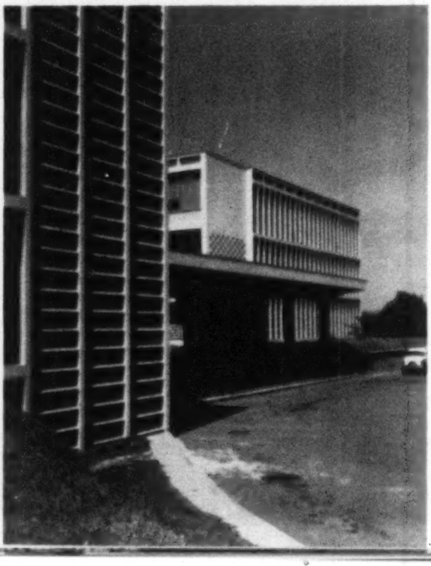


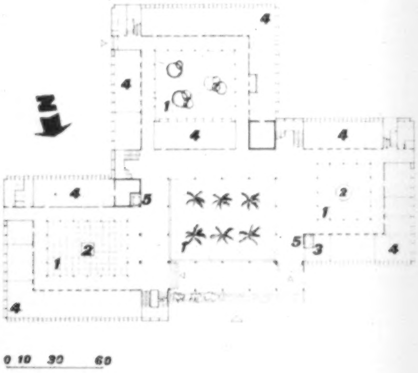


half upper floor plan (left) and ground floor plan (right) flats at Jesselton
key 1, lift lobby. 2, dining room. 3, living room. 4, study. 5, 8, bedrooms. 6, 7, bathrooms. 9, passage. 10, kitchen. 11, 12, 13, 14, 15, stores. 16, garage. 17, ironing. 18, servant. 19, servant's kitchen. 20, lavatory. 21, store. 22, terrace.

8, central Government offices, Jesselton (architect, R. Gordon Brown). Three blocks, each planned round a courtyard, form three sides of a tree-planted square—see plan, far right. Construction is reinforced concrete on a 2ft. 8in. grid, on concrete piling. Sun-control is by galvanized steel or slatted timber louvres and an air-space between the double reinforced concrete roof.

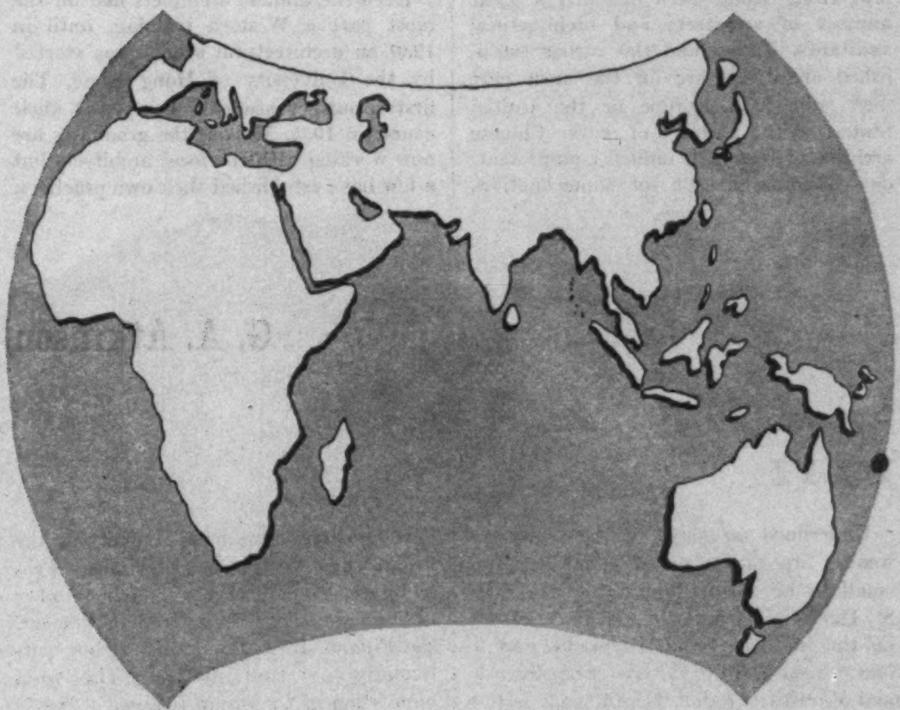
8





ground floor plan, central government offices at Jesselton
key 1, terraces. 2, fountains. 3, enquiry office. 4, offices. 5, lifts.

Eric Cumine



HONG KONG

In 1841 this barren island rock was ceded to the British with a population of about 4,000 villagers and fishermen, living in some 50 villages or hamlets. In 1860 the colony was extended on to the Kowloon Peninsula, and in 1898 the British again extended, acquiring under a 99-year lease a substantial piece of the mainland near Kowloon and a group of islands, now together known as the New Territories. Urban development has been concentrated largely in Victoria, on Hong Kong Island itself, though since the war Kowloon—across the harbour from the island—has also grown enormously.

The area available on Hong Kong Island for urban building was originally no more than a narrow strip of comparatively level ground along the foreshore. As the nineteenth century proceeded, the tiers of houses gradually rose up the sides of the rock, the fashionable residential area rising at the same time.

Reclamation of land from the sea began in the Colony's earliest days, and continued in spite of much opposition from the principal commercial houses with foreshore sites. It failed, however, to keep apace with the increasing population. In 1870 the central part of Victoria, chiefly by now occupied by Chinese, was seriously overcrowded and insanitary. This was one of the factors that led the European community to climb even higher and develop the summits of the Peak as a residential area, a movement hastened from 1888 onwards when Peak and city were linked by a funicular railway. The Colony continued thereafter to grow steadily, but its most spectacular increase in population took place after the end of the second World War.

A brief period of military administration was followed by the formal re-establishment of civil government in May, 1946. From the moment of liberation from the Japanese, Hong Kong made an astonishing recovery. In August, 1945, it was estimated that the population had been reduced to about 600,000. Eighteen months later at least 1,000,000 people had returned, and the population was still rising. Once again there was an acute housing problem and water shortage. At the end of 1959 the population was estimated at 2,919,000.

One of the most striking features of the post-war years has been the steadily increasing part which the Government has begun to play, directly or indirectly, in the provision of housing and other forms of social services for this increasing population, and especially for the poorer sections of the community. But in addition private building on a wide scale has transformed and modernized much of the urban areas and the more accessible parts of the New Territories. Particularly in Kowloon and Tsuen Wan, industrialists have opened large modern factories, producing a wide range of goods for export throughout the world. To meet the demand for more land for industry and housing, the Government has continued the traditional policy of reclamation. It has also embarked on a large-scale reconstruction of the Colony's road network. More rigorous traffic controls have been introduced in the face of enlarged public transport services and the increase in number, and in size, of private cars in daily use. The railway has changed from steam to diesel-electric traction.

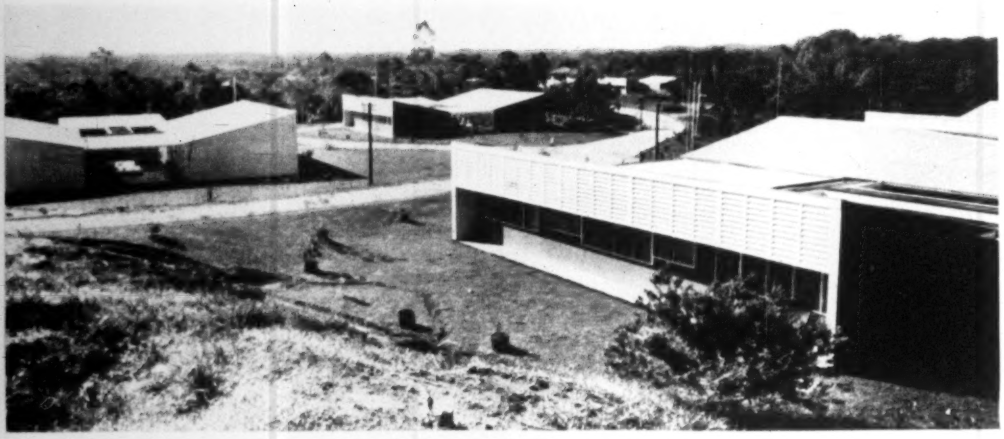
The Government, with an unusually progressive and well staffed Public Works Department, has also been active in the provision of schools and hospitals. One of Hong Kong's major problems, at a time of continual refugee influx, has been the provision of adequate medical and health facilities, both official and unofficial. The Colony's earliest hospitals were run by missionary bodies, as indeed are a number at the present time. The first Government hospital was the Civil Hospital, founded in 1859. Part of its large old-fashioned buildings is still in use, and on the remainder of the original site there stands today the spacious and modern Tsan Yuk Maternity Hospital, opened in 1925, and the Queen Mary Hospital, one of the largest and most up to date in Asia, opened in 1937. This is now being doubled in size.

An increased, and ever increasing, tempo is apparent in every aspect of Hong Kong's daily life, but it is the growth of local industry which came into being to replace the traditional entrepôt trade of the Colony which has been the most significant feature, after population growth, of the post-war years.

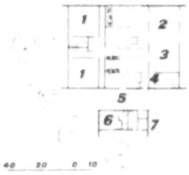
In 1955 two changes in the law allowed much higher building, and made it very much easier to get possession of tenanted buildings by compensating the evicted tenants. As a result, buildings between fourteen and twenty storeys high are becoming common, particularly in Victoria and in the newly built area to the east, from Causeway Bay to North Point, in a burst of building in which Hong Kong is trying to catch up with the demand for housing. The old solution of making land by reclamation or levelling is still in vigorous progress; but instead of the new land being covered with closely packed buildings there are tall square blocks, with plenty of breathing space between. In the town centres, particularly in Victoria, buildings sometimes in excellent repair are being torn down to be replaced by much higher ones. Gradually the pre-war, arcaded building, with square pillars covered in Chinese characters denoting the names of the shops, is giving way to the steel-framed structures whose overhanging, if any, needs no pillars and leaves the pavement clear.

BRUNEI

5



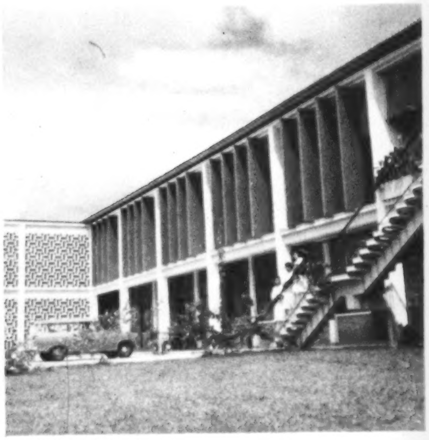
5, *senior Government officers' quarters (architects, Public Works Department, Brunei): a group of identical single-storey houses, each with living-rooms and bedrooms separated by a courtyard—plan of individual house on right. The two wings of each house are linked by a trellis. They have load-bearing cavity end walls. The side walls, facing both inwards and outwards, are all window or louvred panels.*



ground floor plan, officers' quarters

key
1, bedrooms.
2, living area.
3, dining area.
4, kitchen.
5, garage.
6, servants.
7, laundry.

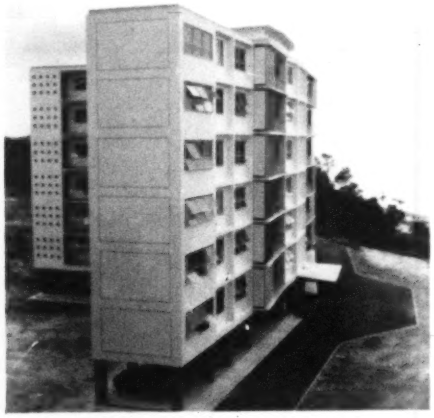
6



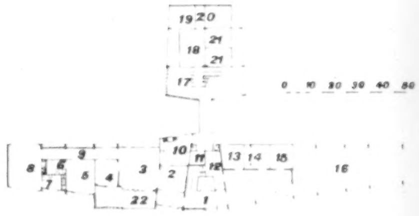
6, *girls' school, Brunei town (architects, Booty, Edwards and Partners): a two-storey building planned round an open court, with sun-screening either by means of vertical fins (right of photograph) or decorative concrete grilles (on the left). Construction is reinforced concrete with brick infill panels and timber roofs. The roofs are covered with glazed tiles.*

NORTH BORNEO

7

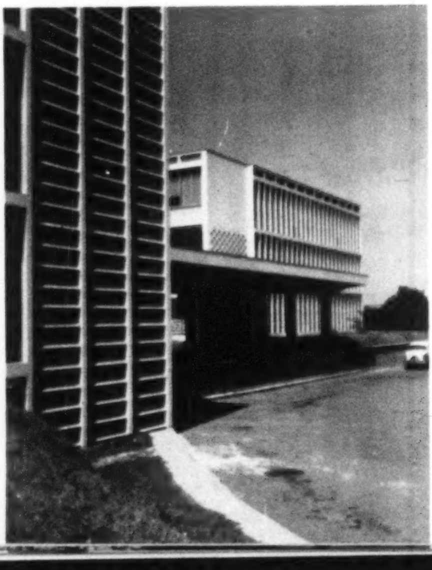


7, *flats at Signal Hill, Jesselton (architects, Palmer and Turner): twelve two- or three-bedroom flats with servants' quarters additional, planned in two linked blocks at right-angles—see plan, far right. Construction is reinforced concrete with brick infill panels.*

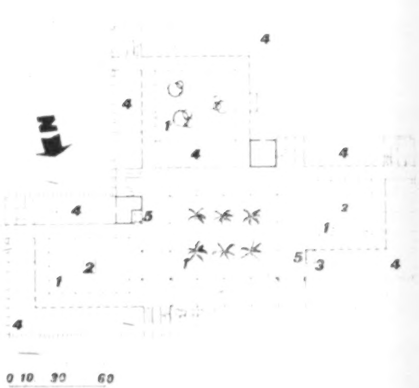


half upper floor plan (left) and ground floor plan (right) flats at Jesselton
key 1, lift lobby. 2, dining room. 3, living room. 4, study. 5, 8, bedrooms. 6, 7, bathrooms. 9, passage. 10, kitchen. 11, 12, 13, 14, 15, stores. 16, garage. 17, ironing. 18, servant. 19, servant's kitchen. 20, lavatory. 21, store. 22, terrace.

8

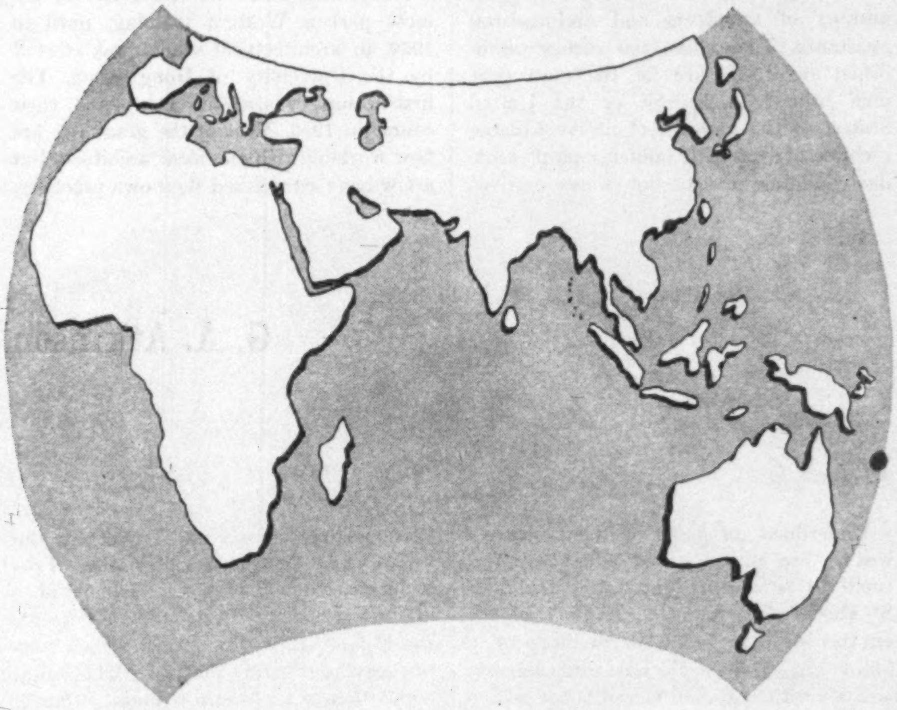


8, *central Government offices, Jesselton (architect, R. Gordon Brown). Three blocks, each planned round a courtyard, form three sides of a tree-planted square—see plan, far right. Construction is reinforced concrete on a 2ft. 8in. grid, on concrete piling. Sun-control is by galvanized steel or slatted timber louvres and an air-space between the double reinforced concrete roof.*



ground floor plan, central government offices at Jesselton
key 1, terraces. 2, fountains. 3, enquiry office. 4, offices. 5, lifts.

Eric Cumine



HONG KONG

In 1841 this barren island rock was ceded to the British with a population of about 4,000 villagers and fishermen, living in some 50 villages or hamlets. In 1860 the colony was extended on to the Kowloon Peninsula, and in 1898 the British again extended, acquiring under a 99-year lease a substantial piece of the mainland near Kowloon and a group of islands, now together known as the New Territories. Urban development has been concentrated largely in Victoria, on Hong Kong Island itself, though since the war Kowloon—across the harbour from the island—has also grown enormously.

The area available on Hong Kong Island for urban building was originally no more than a narrow strip of comparatively level ground along the foreshore. As the nineteenth century proceeded, the tiers of houses gradually rose up the sides of the rock, the fashionable residential area rising at the same time.

Reclamation of land from the sea began in the Colony's earliest days, and continued in spite of much opposition from the principal commercial houses with foreshore sites. It failed, however, to keep apace with the increasing population. In 1870 the central part of Victoria, chiefly by now occupied by Chinese, was seriously overcrowded and insanitary. This was one of the factors that led the European community to climb even higher and develop the summits of the Peak as a residential area, a movement hastened from 1888 onwards when Peak and city were linked by a funicular railway. The Colony continued thereafter to grow steadily, but its most spectacular increase in population took place after the end of the second World War.

A brief period of military administration was followed by the formal re-establishment of civil government in May, 1946. From the moment of liberation from the Japanese, Hong Kong made an astonishing recovery. In August, 1945, it was estimated that the population had been reduced to about 600,000. Eighteen months later at least 1,000,000 people had returned, and the population was still rising. Once again there was an acute housing problem and water shortage. At the end of 1959 the population was estimated at 2,919,000.

One of the most striking features of the post-war years has been the steadily increasing part which the Government has begun to play, directly or indirectly, in the provision of housing and other forms of social services for this increasing population, and especially for the poorer sections of the community. But in addition private building on a wide scale has transformed and modernized much of the urban areas and the more accessible parts of the New Territories. Particularly in Kowloon and Tsuen Wan, industrialists have opened large modern factories, producing a wide range of goods for export throughout the world. To meet the demand for more land for industry and housing, the Government has continued the traditional policy of reclamation. It has also embarked on a large-scale reconstruction of the Colony's road network. More rigorous traffic controls have been introduced in the face of enlarged public transport services and the increase in number, and in size, of private cars in daily use. The railway has changed from steam to diesel-electric traction.

The Government, with an unusually progressive and well staffed Public Works Department, has also been active in the provision of schools and hospitals. One of Hong Kong's major problems, at a time of continual refugee influx, has been the provision of adequate medical and health facilities, both official and unofficial. The Colony's earliest hospitals were run by missionary bodies, as indeed are a number at the present time. The first Government hospital was the Civil Hospital, founded in 1859. Part of its large old-fashioned buildings is still in use, and on the remainder of the original site there stands today the spacious and modern Tsan Yuk Maternity Hospital, opened in 1925, and the Queen Mary Hospital, one of the largest and most up to date in Asia, opened in 1937. This is now being doubled in size.

An increased, and ever increasing, tempo is apparent in every aspect of Hong Kong's daily life, but it is the growth of local industry which came into being to replace the traditional entrepôt trade of the Colony which has been the most significant feature, after population growth, of the post-war years.

In 1955 two changes in the law allowed much higher building, and made it very much easier to get possession of tenanted buildings by compensating the evicted tenants. As a result, buildings between fourteen and twenty storeys high are becoming common, particularly in Victoria and in the newly built area to the east, from Causeway Bay to North Point, in a burst of building in which Hong Kong is trying to catch up with the demand for housing. The old solution of making land by reclamation or levelling is still in vigorous progress; but instead of the new land being covered with closely packed buildings there are tall square blocks, with plenty of breathing space between. In the town centres, particularly in Victoria, buildings sometimes in excellent repair are being torn down to be replaced by much higher ones. Gradually the pre-war, arcaded building, with square pillars covered in Chinese characters denoting the names of the shops, is giving way to the steel-framed structures whose overhanging, if any, needs no pillars and leaves the pavement clear.

The provision of housing, probably the most important field of enterprise in Hong Kong at the present time, is faced by planning problems quite different from those of the West, if only because of the shortage of land on which to build and the extremes of accommodation demanded. These range from flats with space-standards as low as 35 sq. ft. per person, plus kitchen and lavatory, to flats and houses of Western standard, from 800 to as much as 3,000 sq. ft. in area, but with quarters for living-in servants. The servants' rooms are generally next to the kitchen and must not be seen from the main rooms.

Chinese cooking, which involves a lot of deep-fat frying, together with the high cost and expensive upkeep of mechanical ventilation, makes internal kitchens and bathrooms undesirable. As a result the average plan of a block of flats has a large perimeter, with all such rooms provided with windows on an outside wall.

Speculative building is organized on the basis of a quick return of the capital invested (between three to five years), which limits the architect's scope in the way of refinements in details and demands the use of lasting materials. Such speedy designing and building tend to result in buildings which are cliché-ridden. Novel features introduced into any building are repeated in others *ad nauseam*. Such repetition in itself is partially, however, responsible for a place producing its own style—or a style with its own peculiar clichés, and Hong Kong's contacts with the outside world are so close, conditions for import are so liberal, that anything which is economically viable is adopted and adapted.

Hong Kong is about 20 deg. north of the Equator and has a hot, humid summer and a dry winter period of several months, during which the temperature never falls to freezing but cold winds and clouded skies make heating in buildings necessary. It is in the typhoon area, and winds of 134 miles per hour have been recorded. The building industry is highly skilled and local materials are good though limited to sand and stone.

Excellent well-seasoned teak is available and is much used for flooring, outdoor woodwork and furniture. The Chinese carpenter uses primitive tools but is a sensitive and competent craftsman. Locally manufactured bricks and tiles now replace those formerly imported from China, but their range is limited. There are also local ceramic units, which are widely used for grilles and the like.

In the pre-war days, most of the practising architects either came from abroad or had set up on their own after serving as articled pupils under the same architects. Since the second World War the refugees from mainland China who have flooded into Hong Kong have included a great number of architects and architectural assistants. These, like the earlier established architects, are for the most part men trained in Europe or the United States, so the heritage of native Chinese architecture has little influence on present-day building, except for some motives derived from it, employed in such details as decorative grilles.

Even the Chinese architects had for the most part a Western training, until in 1950 an architectural school was started by the University of Hong Kong. The first group of students completed their course in 1955. Most of the graduates are now working with the local architects but a few have established their own practices.

G. A. Atkinson

FIJI

Underlined on maps of the Commonwealth are many island territories too small to be coloured in red: places like St. Helena, once important as a port of call on the route to India; Bermuda, now a luxury resort off the US Eastern Seaboard; and Mauritius, Indian Ocean sugar island whose people—though mostly Hindu—speak French. The largest number of these islands lie in the Caribbean Sea and the Pacific Ocean. The West Indies are well known; their architecture is described and illustrated elsewhere in this issue.

We know less about the Pacific Islands. Before the Japanese War the names which came first to mind would have been Tahiti, a French island, and Hawaii, which recently became the 49th of the United States. Japanese invasion and American reconquest gave fame to such names as Guadalcanal in the British Solomon Islands and Tarawa, one of the Gilbert and Ellis Islands. The personality of Queen Salote interested Coronation Londoners in Tonga, another small Pacific island.

Most important of these islands is the Fiji Group which straddle the 180 deg. meridian and lie about 1,200 miles south of the equator on the air route from Hawaii to Australia. They include 300 islands, about 100 of which are inhabited; but only two are of any importance, Viti Levu and Vanua Levu. It is on the first, Viti Levu, where are to be found the islands' capital, Suva, its international airport, Nandi, and two of its main sources of wealth—sugar and gold. Its other main source of wealth—the growing of coconuts for copra, a romantically lazy but not very profitable pastime—is distributed throughout the group.

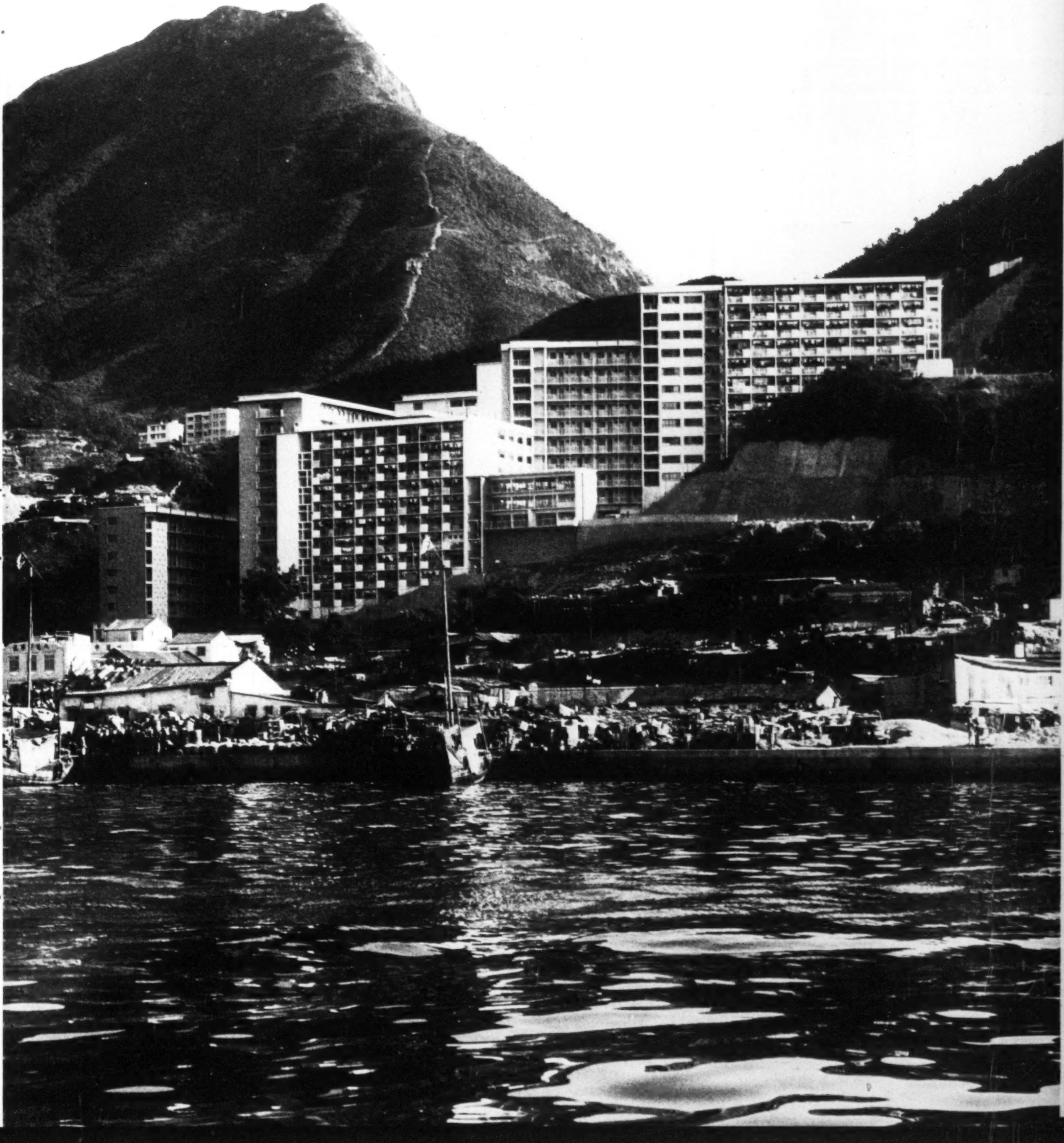
First mapped by William Bligh of *Bounty* fame, the islands were mainly inhabited by a predominantly Melanesian people, when in 1874, under a Deed of Cession, they were handed over by the Fijian Chiefs to Queen Victoria as a Protectorate. Though now second in number to immigrant peoples of Indian descent, the Fijians still enjoy special rights, particularly on land matters. The total population of the group is about 370,000.

An engraving of the 1874 cession ceremonies shows a verandahed range of corrugated iron roofed offices where the new Administration had established its headquarters. They contrast sadly with the Fijians' own traditional thatched 'bures.' Unfortunately, as in many other countries, the materials needed for traditional rural building techniques—like reeds and bamboos, which grow wild—are becoming scarce as more land comes under cultivation. Skills are dying out, and the 'bures' are being replaced by timber and sheeted cottages. Until recently, much of the building in Fiji was in wood, usually with corrugated iron or asbestos cement sheet roofs. Many of the architects and builders came from New Zealand or Australia and brought techniques and styles with them. In recent years, concrete has become a popular material. Cement and most other building materials have to be imported. The only local material of any importance is timber, likely to be used increasingly as modern preservation techniques are introduced. (Fiji suffers seriously from dry wood termite infestation.)

Lying 18 deg. south, Fiji enjoys a tropical island climate tempered by cool breezes in the winter season (May to October). Suva, the capital, is on the wetter side of Viti Levu. Its climate, being more humid, less sunny and with more breezeless days, is less pleasant than that at Nandi, on the north-west coast. Like other islands lying towards the tropics, Fiji from time to time is struck by hurricanes, the last serious storm being in 1952.

HONG KONG

1



1. low-cost housing at Sai Wan Chuen (West Bay Village), for the Hong Kong Housing Authority (architect, T. S. C. Feltham). Consists of five blocks of one-room deep flats—to provide cross-ventilation—placed across the contours of a hillside site. The approach road enters the scheme at the half-way level, from which there are lifts to all floors above but stairs only to the floors below. There are 640 flats altogether, varying in size for four-, five- and six-person families. Both balcony and staircase access are used.

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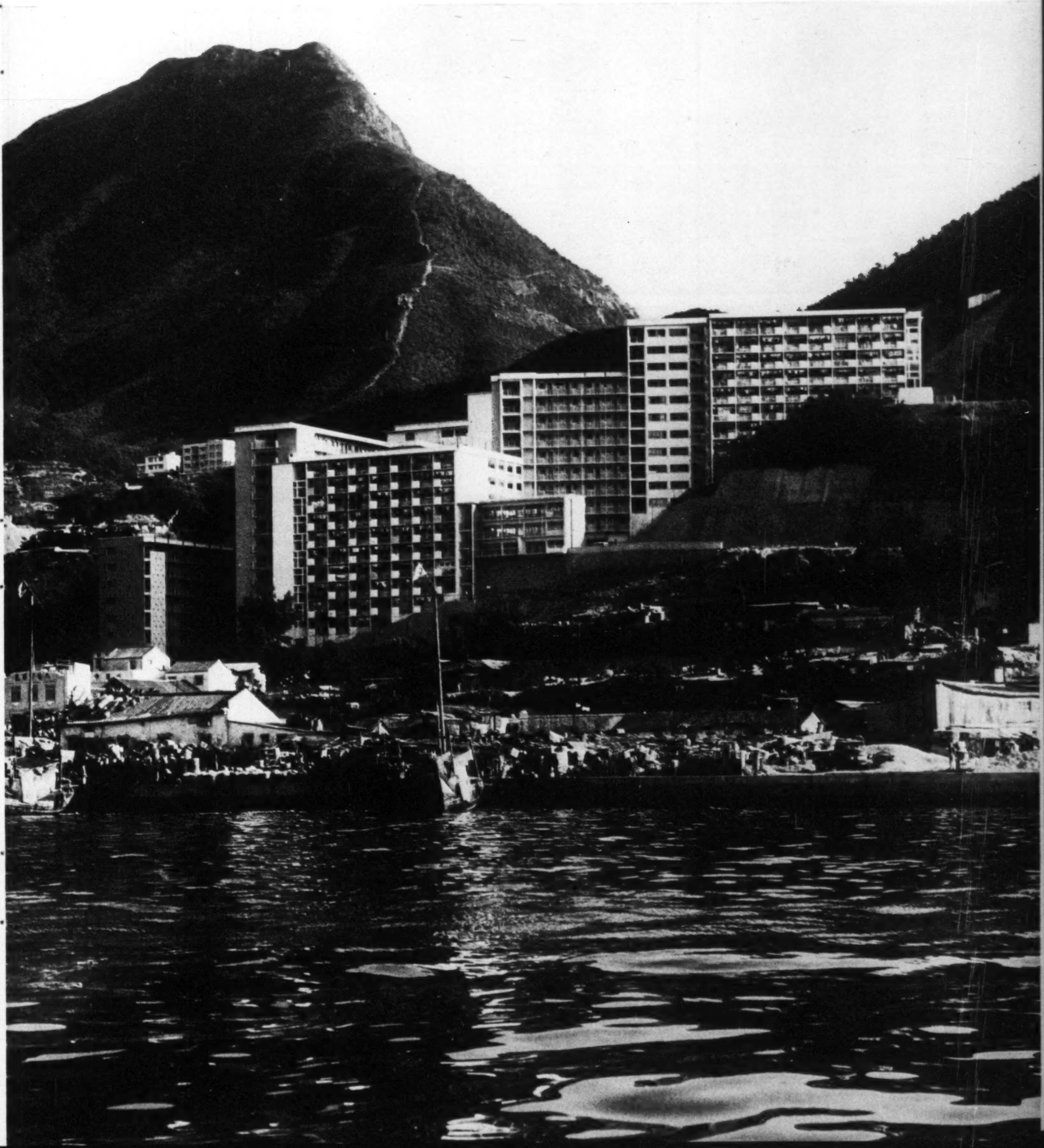
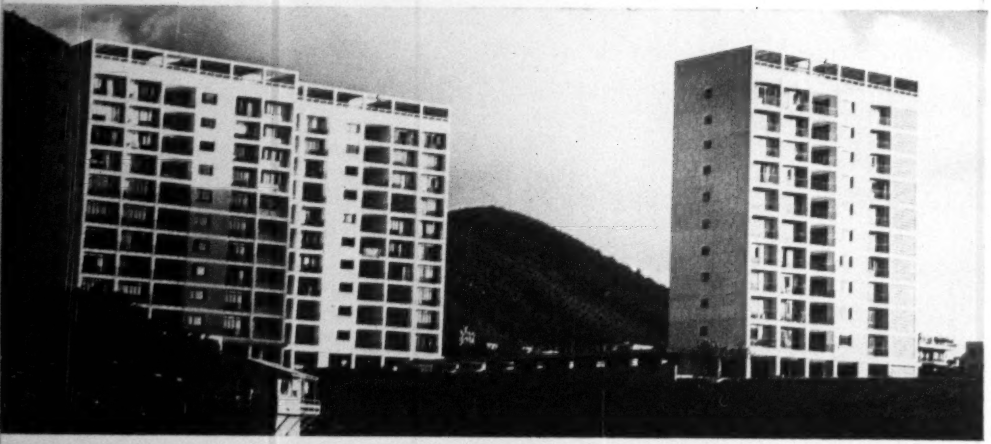


HONG KONG



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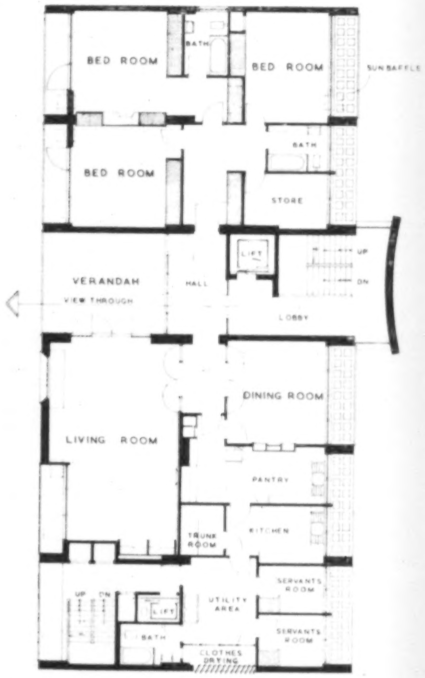
BED ROOM
BATH
BED ROOM
SUN BAFFLE
BATH
BED ROOM
STORE
LIFT
UP
DN
VERANDAH
VIEW THROUGH
HALL
LOBBY
DINING ROOM
LIVING ROOM
PANTRY
TRUNK ROOM
KITCHEN
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LIFT
UTILITY AREA
BATH
SERVANTS ROOM
CLOTHES DRYING

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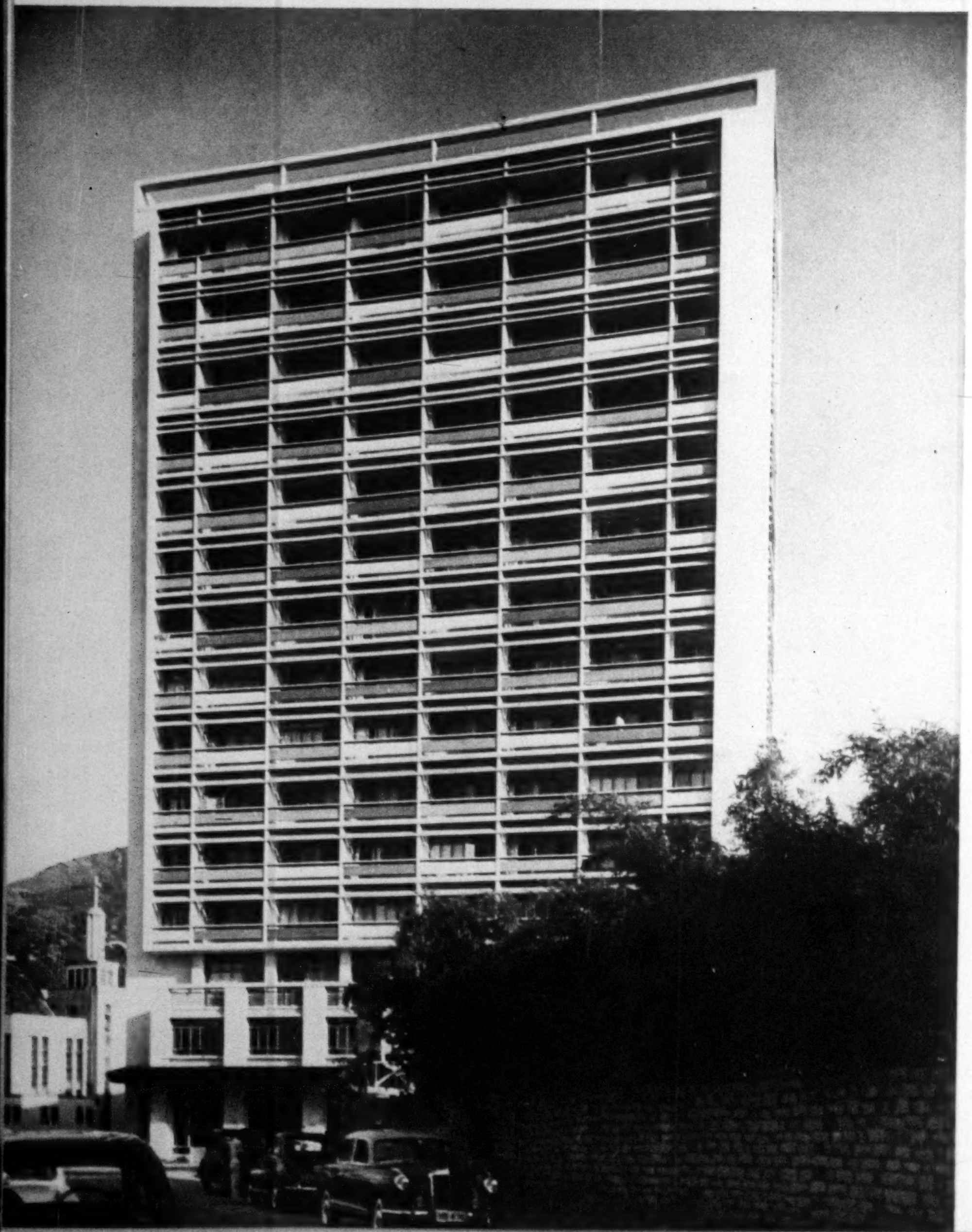
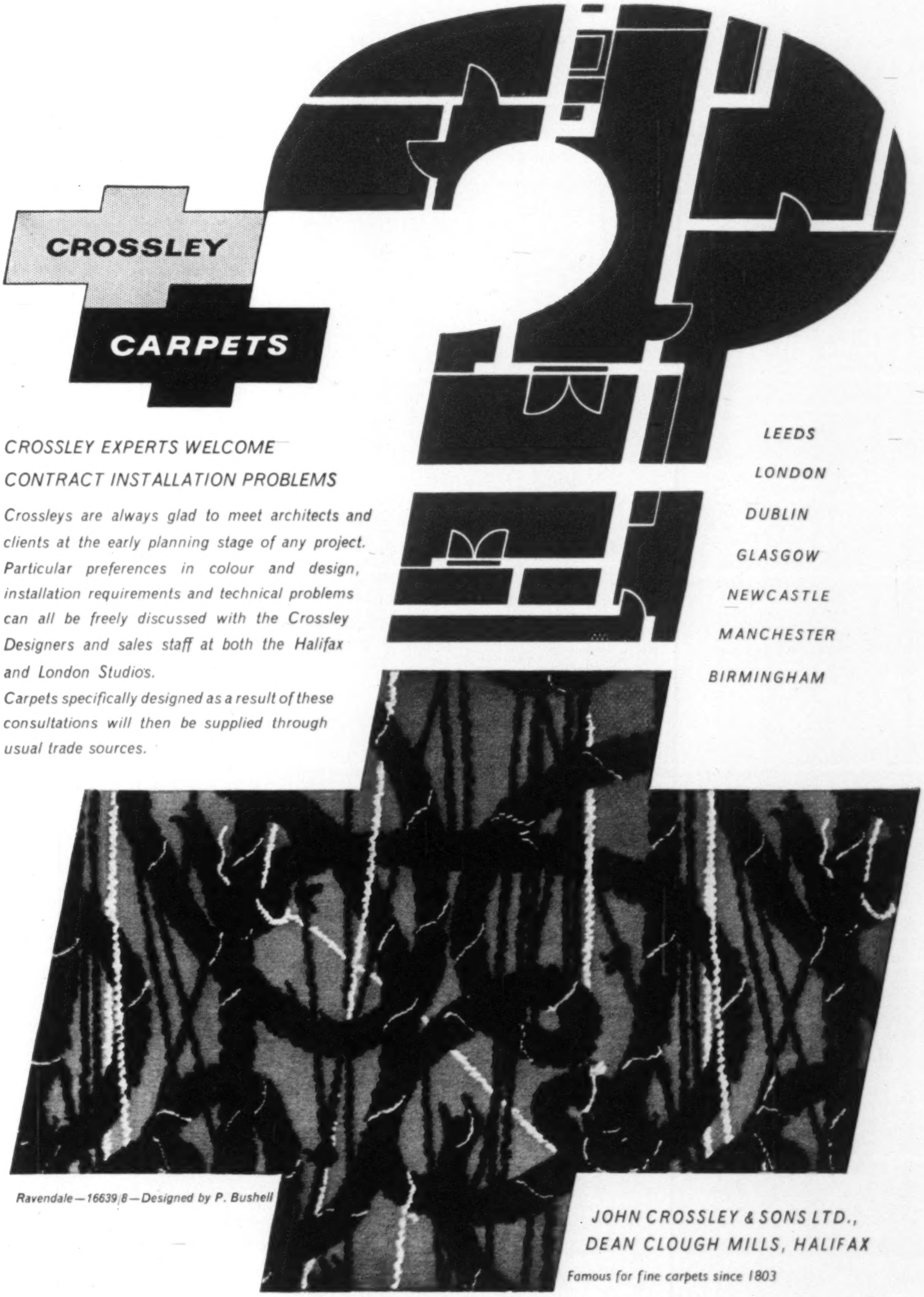


2 *(above left), staff quarters for the Hong Kong Electric Co., called Cavendish Heights (architects, Leigh and Orange): the blocks are linked by a courtyard and contain identical flats, one to each floor. They face north-west and south-east with views over the harbour. Since many of the occupants are engineers engaged on shift-work, the flats (see plan above) have been divided into noisy and quiet areas separated by the lift, staircase, entrance and main verandah. The quiet area, containing three bedrooms and two bathrooms, can be separately air-conditioned. The living-room and dining-room can be thrown into one. There is covered drying-space on the roof of each block.*

3, *flats — Tower Court — (architect, Eric Cumine): a block facing north and south containing a variety of flats from single-room studio flats to maisonettes that occupy almost two complete floors. All living and bedrooms have balconies and all bedrooms connected bathrooms. The maisonettes are entered at the bedroom level with the living-rooms above, in order to allow kitchens, etc., to face the back without interfering with horizontal circulation and to restrict noise-transmission from living-rooms to the bedrooms of the same flat. The whole eleventh floor is occupied as offices by the Indian Consulate together with a two-bedroom flat. The twelfth floor is one large flat. Half the thirteenth and the whole of the fourteenth floor together form a large penthouse maisonette with five bedrooms and living-room and dining-room which, when united by sliding doors, occupy half the floor-area of the building. The other half of the thirteenth floor is a full-width one-room flat.*



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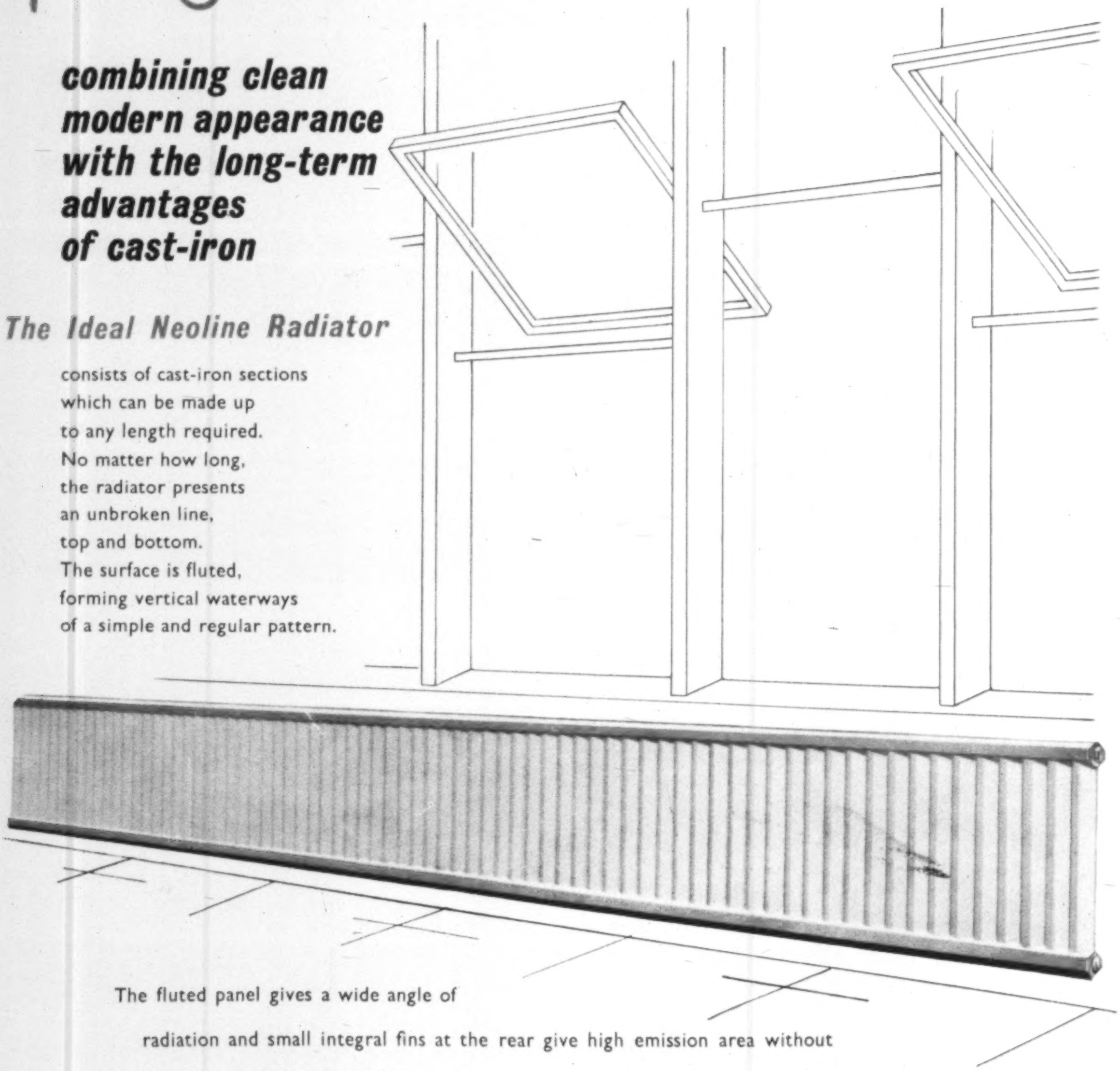

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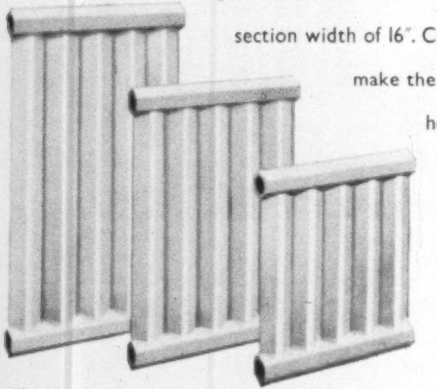

IDEAL CAST-IRON RADIATORS

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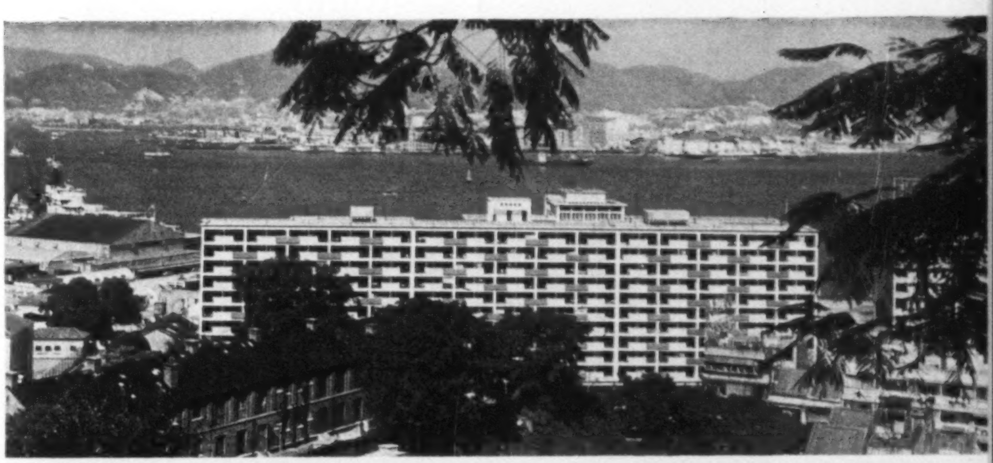
448

HONG KONG

4, police married quarters, Arsenal Yard (architects, Public Works Department; architect in charge, T. T. Wong). A primary school occupies the whole ground floor. Above are ten floors of thirty dwellings, each consisting of one large all-purpose room with a verandah facing south, the kitchen forming part of the verandah. Access is from balconies along the north side, reached by lifts. Lavatories and washrooms are grouped in two separate projecting wings, with a drying-space between. Construction is reinforced concrete bearing walls.



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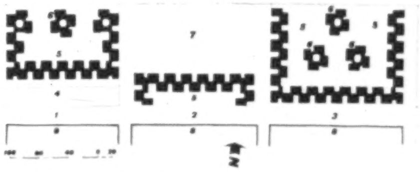
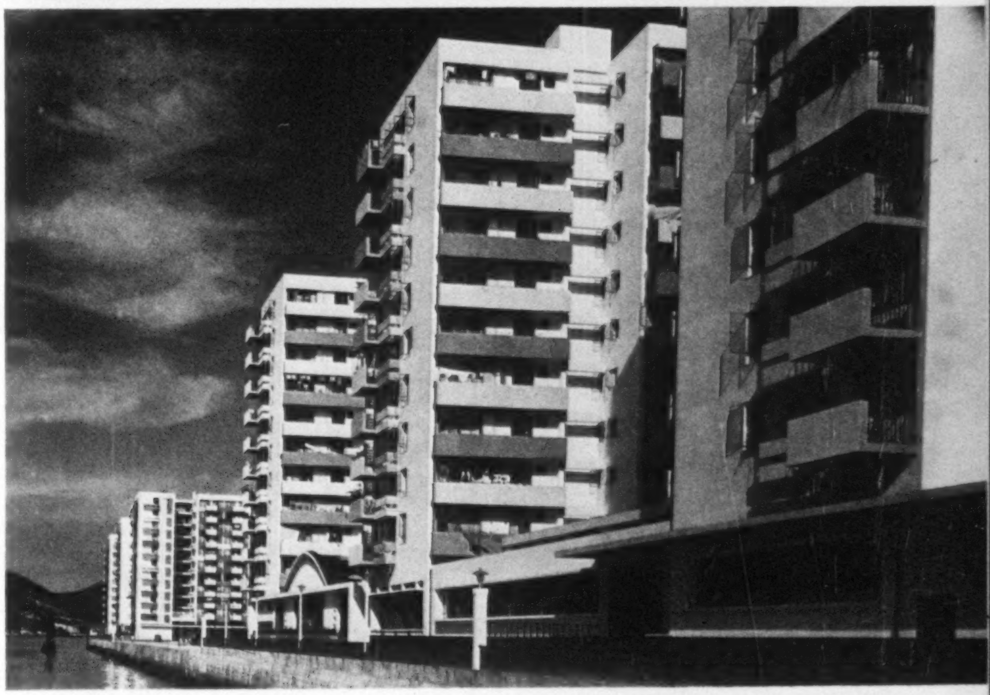


site plan, housing at North Point

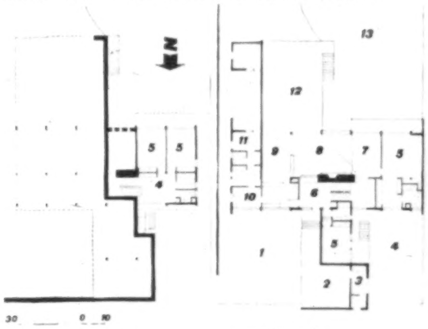
key 1, west estate. 2, centre estate. 3, east estate. 4, government printing works. 5, playgrounds. 6, point blocks. 7, bus concourse. 8, existing buildings.

5, low-cost housing, North Point (architect, Eric Cumine): a scheme for the Hong Kong Housing Authority, accommodating 12,300 people—see site plan above—giving a density of 2,000 per acre. There are wide promenades along the harbour frontage (shown in the photograph). The tower blocks in the middle of the two flanking sections have covered play-areas at ground level and ten floors of flats above. The scheme includes a community centre and 71 shops. Later there will be a bus terminus and a ferry pier. The flats vary in size to house from three to eight people. Construction is reinforced concrete with brick infill walls.



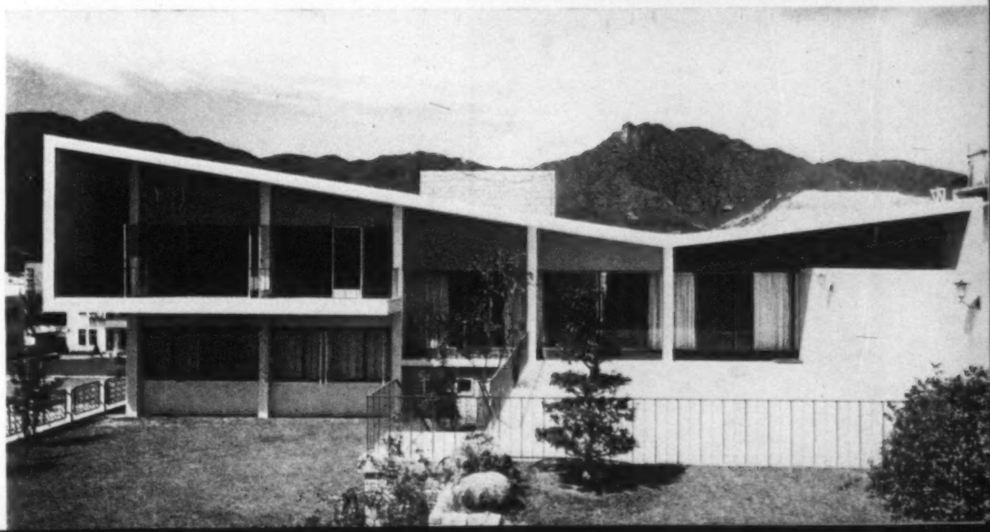
5

6 (below), house on a hillside site across the harbour from Hong Kong Island (architect, Stanley T. Kwok). It is on two levels—see plan below. All main rooms face south and get the benefit of the view and prevailing sea-breezes. The apparent size of the living-room is increased by a study-ante-room to the main bedroom in the form of a balcony. Beneath are children's bedrooms adjoining a play area and two more bathrooms. The house has a reinforced concrete frame.



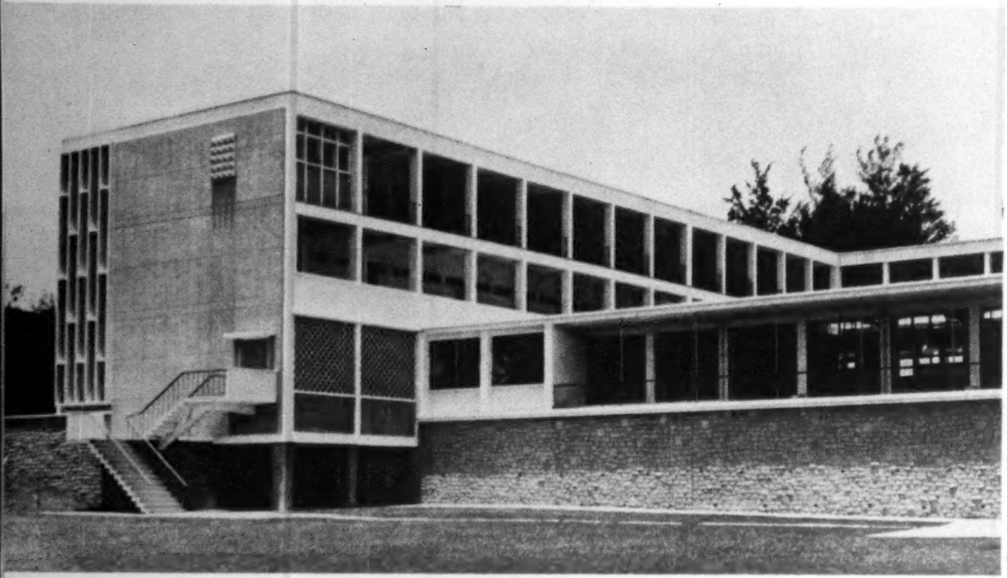
lower ground floor plan **ground floor plan**

key 1, yard. 2, garage. 3, chauffeur. 4, children's playing areas. 5, bedrooms. 6, foyer. 7, study. 8, living room. 9, dining room. 10, kitchen. 11, servants. 12, terrace. 13, garden.



6

HONG KONG



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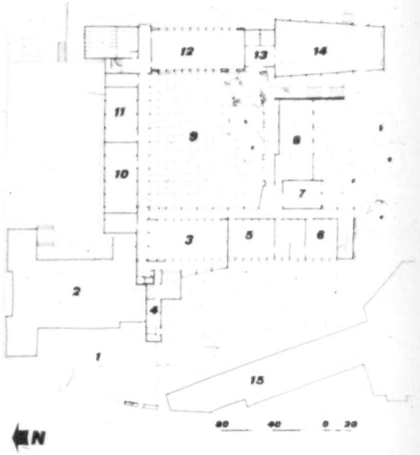
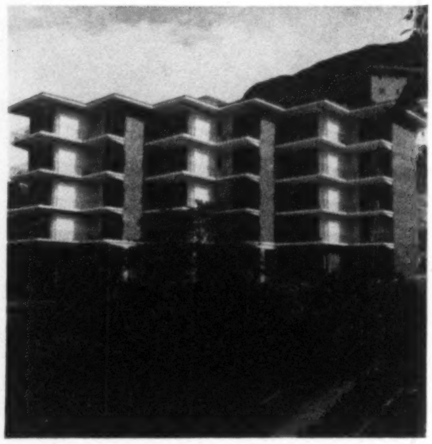


ground floor plan, teachers' training college, Kowloon
key 1, car park. 2, existing assembly hall. 3, dining room. 4, kitchen. 5, handicraft room. 6, pottery room. 7, project room. 8, study room. 9, paved area. 10, female students. 11, male students. 12, existing gymnasium. 13, foyer 14, lecture hall.

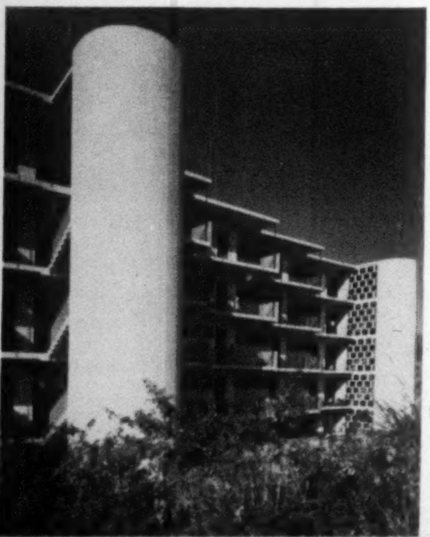
7 (above), teachers' training college, Kowloon (architects, Public Works Department; architect in charge, D. G. Farrow): an extension of the original Grantham training college. The new accommodation—see plan top right—consists of lecture and tutorial rooms and special classrooms, library, refectory and a lecture-hall seating 340 also used for practice instruction of primary school childen. Access balconies, projecting eaves, vertical fins and precast concrete grilles protect the rooms from the sun. Construction is reinforced concrete with a steel truss roof over the lecture hall. Infill walls are rendered brick.



8

8 (left), university flats (architect, R. Gordon Brown)—see also AR, June, 1956: on a steep site in the university grounds, facing west over the harbour. The saw-tooth plan turns the windows away from the sun. There are three flats per floor, two with two bedrooms and one with one. Construction is a reinforced concrete frame with cross walls of local granite and louvres and other external woodwork of teak.

9 (below), Government primary school at Kowloon (architect, W. Szeto). It consists of 24 classrooms for 45 pupils each, three larger specialized teaching rooms, offices, staff rooms, etc. At ground-floor level—see plan to right of photograph—is a covered playground linking the staircase hall with the single-storey lavatory block and the classrooms over. These are given north lighting by a saw-tooth plan. The entrance block contains the special teaching and staff rooms, also over a covered playground.



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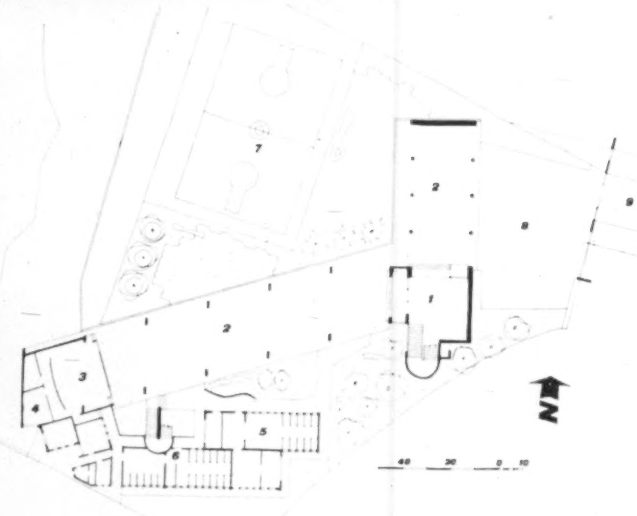

ground floor plan, primary school at Kowloon

key
1, entrance hall.
2, covered playground.
3, platform.
4, dressing room.
5, boys' lavatory.
6, girls' lavatory.
7, basket ball court.
8, car park.
9, approach road.

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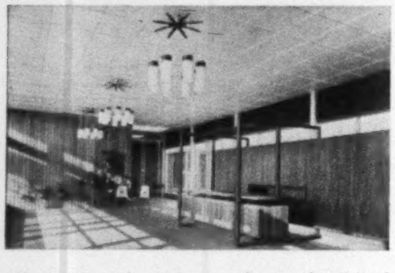

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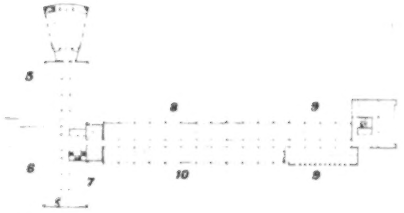
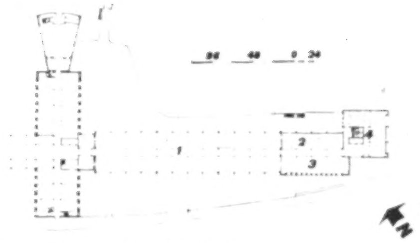
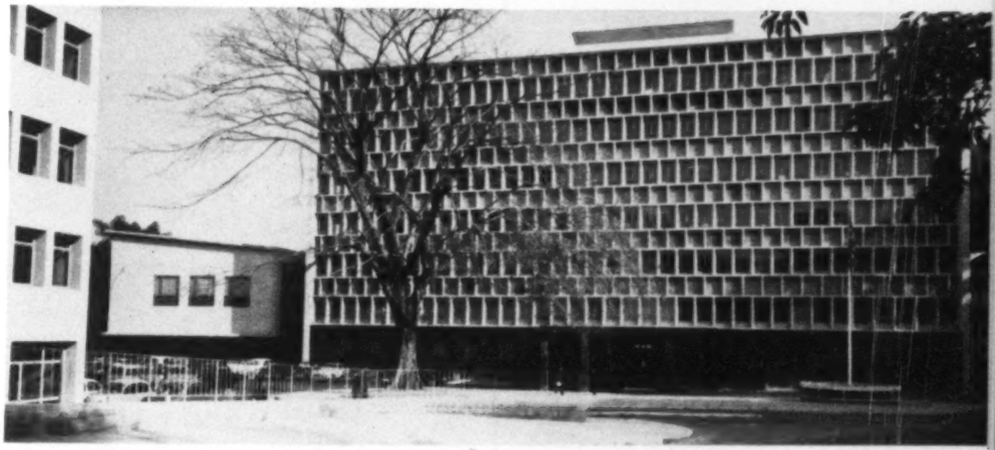


first floor plan

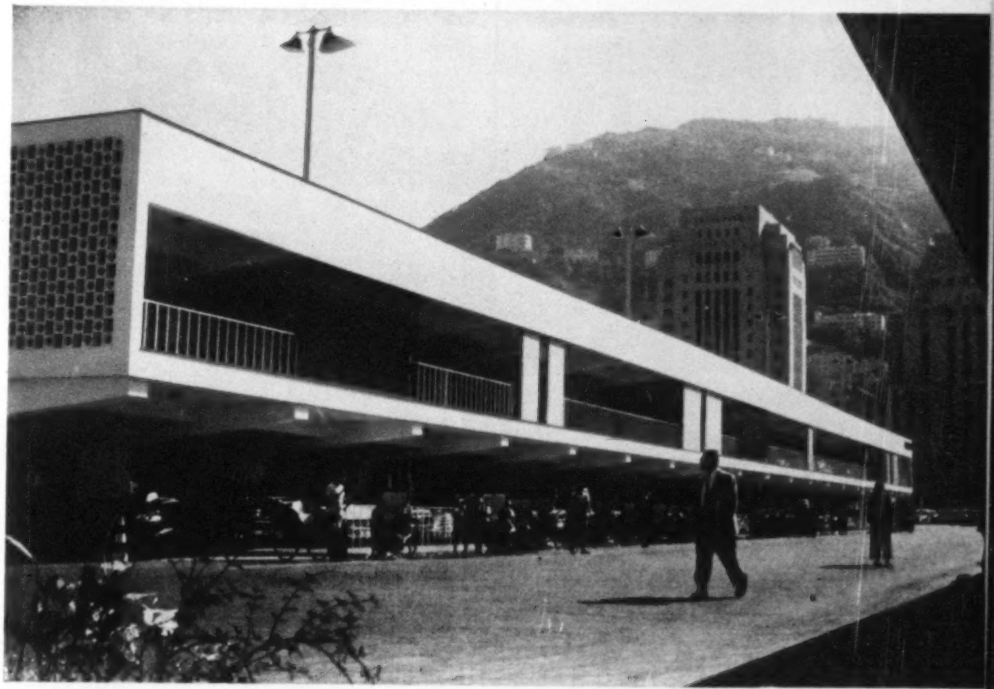


ground floor plan, central government offices
key 1, car park. 2, paying office. 3, dining room. 4, clinic. 5, council chamber suite. 6, quartering authority. 7, legal department. 8, 10, building ordinance offices. 9, port works offices.



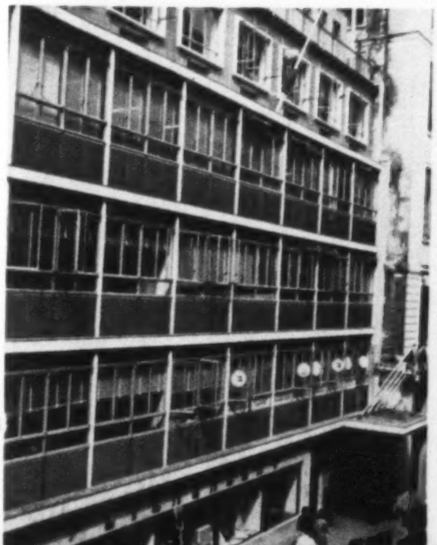
10

10 (above right), central Government offices (architects, Public Works Department; architects in charge, J. C. Charter, J. T. Mallorie, A. Fitch and J. B. Aitken): a T-shaped block of offices with a council chamber at the end of one wing—see plans above—sited above the central area of Victoria city. The height was kept low so as not to obstruct the views over the harbour from Government House, further up the hill. The offices, which are air-conditioned, are 19ft. deep and planned on a 4ft. 6in. window bay. The fins between windows are part of the structural reinforced concrete frame. Below the windows are slate panels separated by precast mullions.



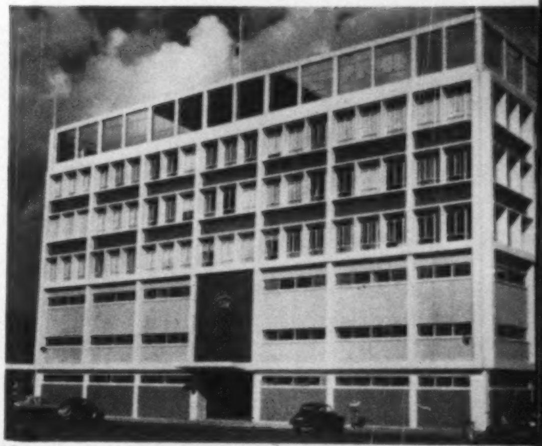
11

11 (right), ferry concourse and car-park (architects, Public Works Department; architects in charge, A. Fitch and R. J. Phillips): on land reclaimed from the harbour near the centre of the city and the future city hall. A three-tier car-park—seen in the photograph—is combined with pedestrian paved areas and covered waiting-spaces for the ferry that crosses the harbour to Kowloon. The upper levels of the car-park, which is of reinforced concrete cantilevered over the approach, are reached by structurally independent ramps. It accommodates 405 cars.



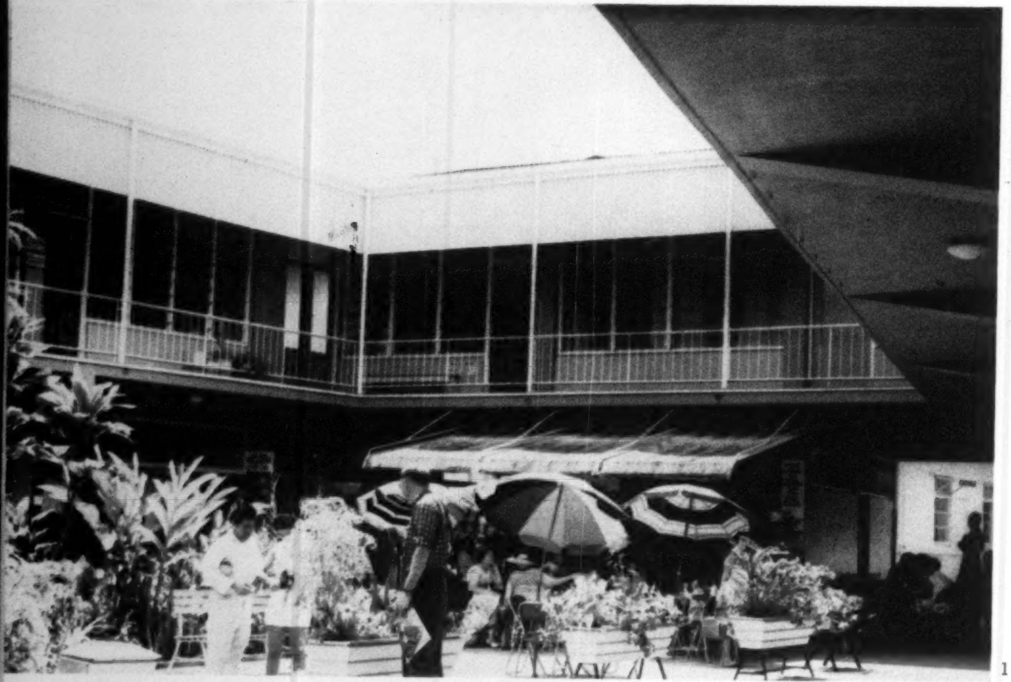
12

12 (right) office building (architects, Leigh and Orange) known as Caxton House. The façade treatment derives from the need to enable individual tenants to install their own air-conditioning, the units for which can be fitted behind the louvred panels beneath the windows, avoiding the unsightly exposure of air-conditioning units which often occurs when there is no central plant.



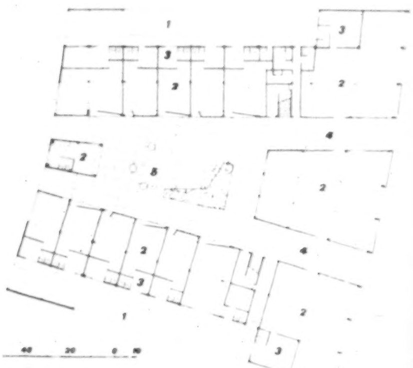
13

13 (far right), shipping offices and warehouse, North Point (architects, Palmer and Turner): a free-standing six-storey block for the Royal Inter-Ocean Lines planned round a central light-well—reinforced concrete frame construction. The lower three floors are given to storage of ships' gear and supplies.



1

1, *shopping arcade at Suva, with offices over (architect, Gordon J. Larsen), planned round three sides of a paved square, open to the south-east which is the direction of the prevailing breeze—see plan below. The offices are reached from a balcony that overhangs the entrances to the shops.*

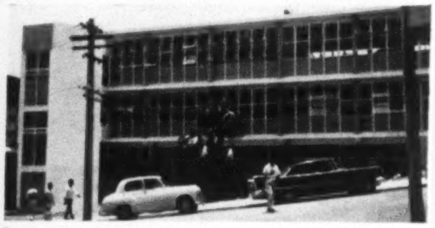


ground floor plan, shopping arcade at Suva

key 1, service courts. 2, shops. 3, stores. 4, access ways. 5, centre court.

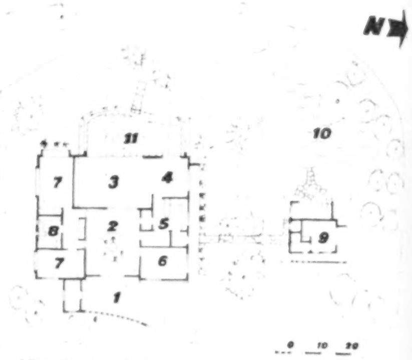
2

2, *central medical school (C. N. Nettleton, Government architect): contains hostel and teaching accommodation for 100 students. The U-shaped plan has a central wing containing the assembly-hall. Access is from open balconies—photograph from the north-east.*



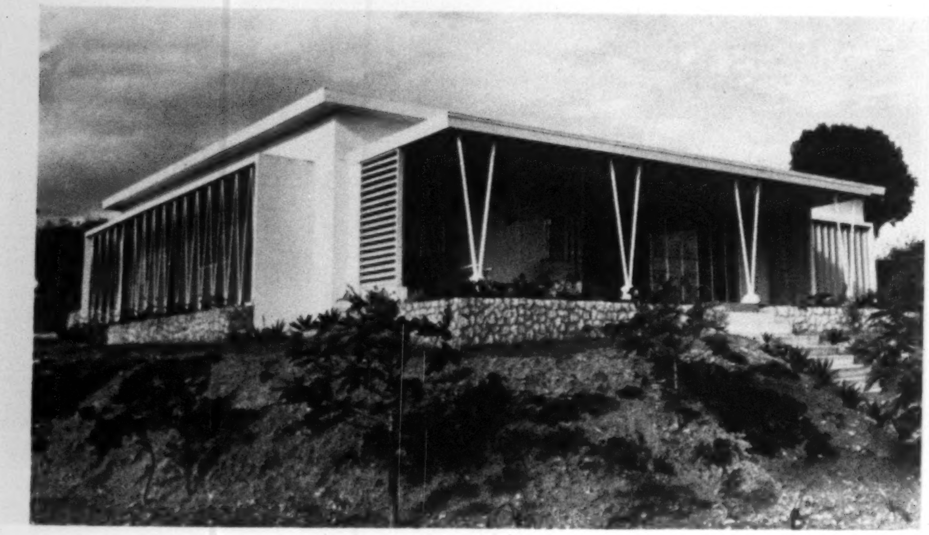
3

3, *offices and shops, Suva (architects, Larsen and Associates). Built across a sloping site, it has shops on the ground floor with two floors of office space above. At the lower end (left of photograph) is a free-standing stair-tower, elliptical in shape.*



ground floor plan, house at Tamavua

key 1, garage. 2, courtyard. 3, living room. 4, dining room. 5, kitchen. 6, study-bedroom. 7, bedrooms. 8, bathroom. 9, servants. 10, pool. 11, terrace.



4

4, *house at Tamavua (architect, Hans Furrer)—for the architect's own occupation. The site is high up, with a wide view over nearby hills and Suva harbour, and is orientated to face the view and make the best use of the prevailing breeze. Rooms are grouped round a central yard—see plan above—which is roofed with glass. The house has a reinforced concrete frame with concrete block panel-walls reinforced horizontally against earthquakes and hurricanes. Roofs are timber, treated against termites, covered with galvanized corrugated iron. The main bedroom has movable vertical sun-screens (far left in photograph) and the living-room verandah horizontal louvres.*

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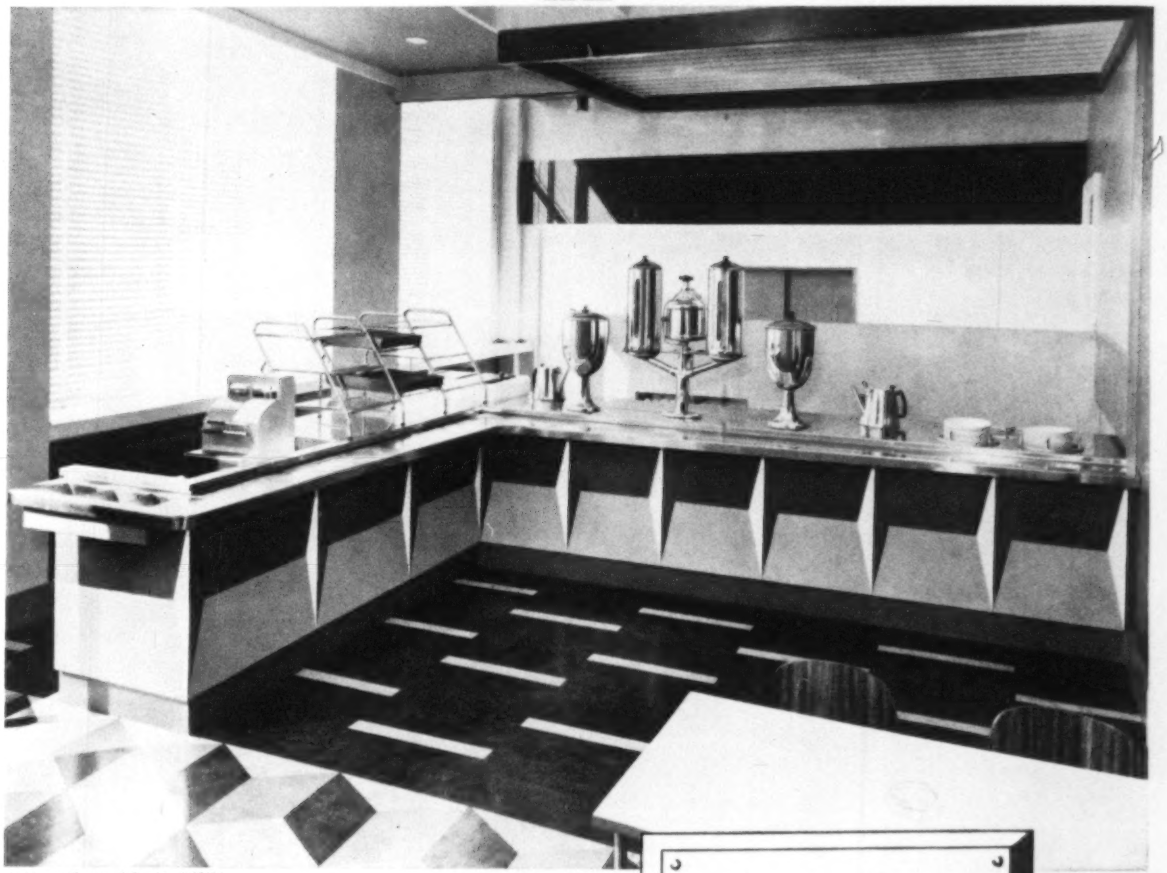

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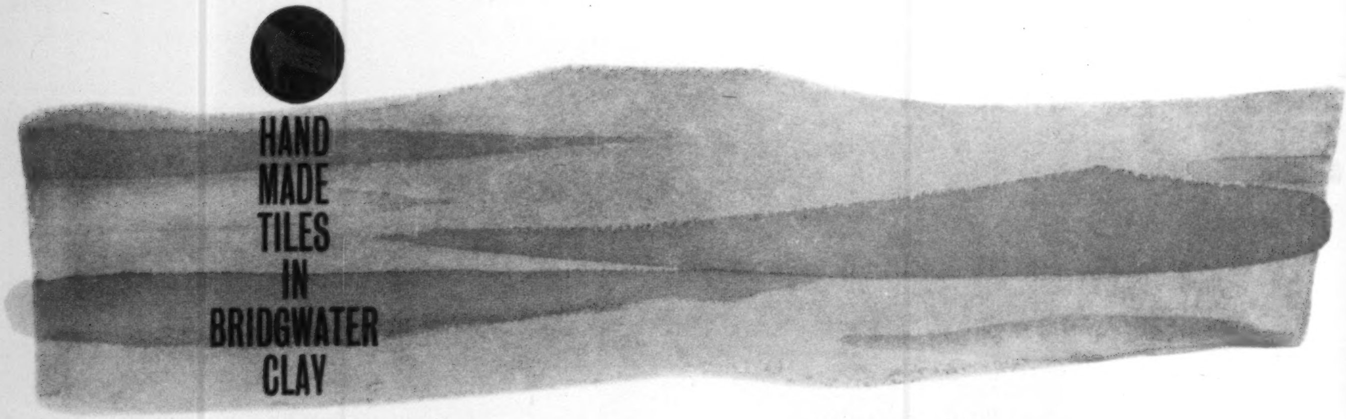

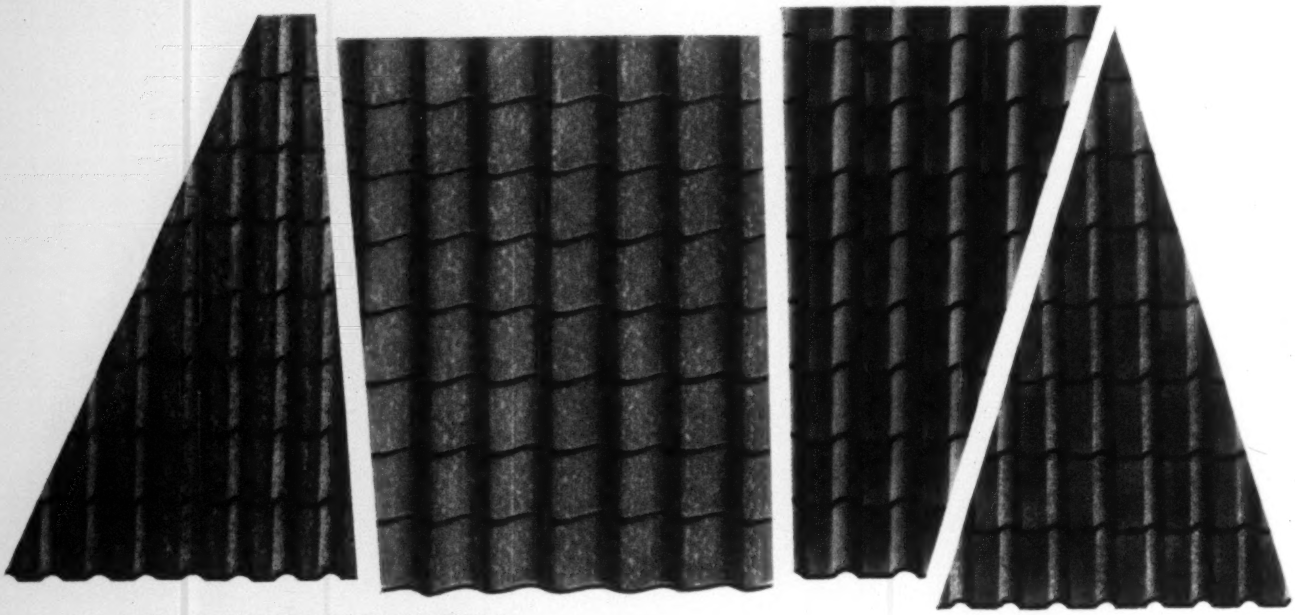

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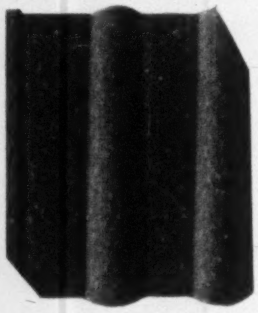

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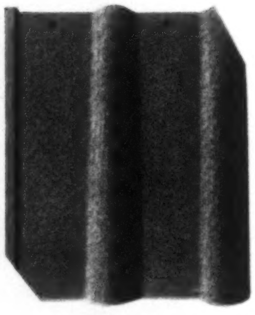

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In the four articles that follow authors with special experience outline and give as much practical information as possible on several problems peculiar to building in the tropics. George Atkinson, head of the Tropical Building Section of the Building Research Station, introduces the subject by outlining the problem of providing comfort conditions in the many different climates which are to be met in the tropical zone. He is followed by a heating engineer, Richard Harrison, who considers how far it is practicable to provide these conditions by using air-conditioning equipment. The last two articles are about the use of materials. Tom Ridley, a structural engineer, advises on the making of concrete and W. H. Ransom of BRS describes how our new man-made materials stand up to tropical use. The first and last articles are printed by kind permission of the Director of Building Research.

G. A. Atkinson

PRINCIPLES OF TROPICAL DESIGN

The author is head of the Tropical Building Section of BRS. He begins by listing the climatic data the architect must seek out. He then outlines a policy to be followed in respect of shade, air movement, thermal insulation, thermal capacity and air-conditioning.

'Where winter never comes' aptly describes the countries whose architecture is reviewed in this issue. Man builds for shelter against the heat of the sun; protection against the cold is secondary or unnecessary. But, within the generality of warm climates, there is marked diversity. To divide them, as is often done, into warm-humid and hot-dry is sometimes convenient; but it hides features of significance and, on occasion, can mislead inexperienced designers. (For example, Aden is hot and arid, yet being on the coast its air is humid.)

The climate at no two places is quite the same; invariably one at least of the determining influences—like latitude, height above sea level, nearness to sea or other large body of water, and to hills or mountains, wetness of the ground and the nature of its vegetation—is different. Moreover, man changes the climate by cutting down forests, draining swamps, damming rivers, and polluting the skies. Very local differences are likewise caused by buildings, roads and open spaces. Generally it is warmer and drier in the centre of a town; breezes blow less strongly; and the sun, because of dust and smoke, shines less fiercely. Descriptions of climates are usually based on meteorological observations made at the local airfield or an open site out of town. In tropical countries conditions in towns are likely to be more trying to man, and less so to his works.

The prudent designer by observation will become as acquainted with the detailed climate of place and site as with the landscape and topography, understanding the changes which his work will cause to the physical environment as well as to the setting. However, an architect may be called on to build in an unfamiliar place. Table 1 summarizes briefly the characteristics of different tropical climates from the standpoint of architectural design. Based on a subjective evaluation of places known to the author, it may guide both those working for the first time under unaccustomed conditions and those attempting to judge how relevant to their familiar circumstances are solutions worked out elsewhere. Approaching for the first time an unusual climate, one can be overwhelmed by a mass of data. It is better to concentrate attention on a few significant features. They include:

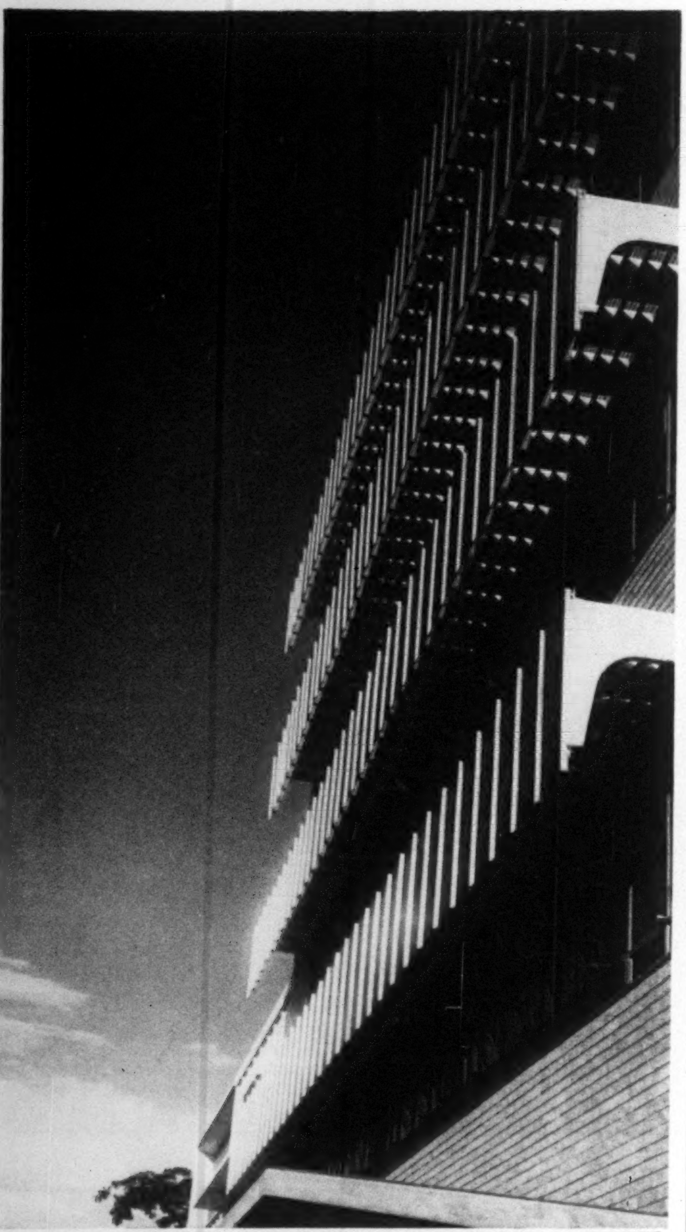
1. *Latitude:* Determines position of sun in sky at different seasons, also length of day; essential for shading design. Indicates how seasonal climate is. Within Tropics (23½ N. and S.), sun overhead at noon twice in year; but hottest on clear summer day between 30 deg. and 45 deg.

2. *Altitude:* With increasing height above sea level, the atmosphere becomes thinner, sunshine stronger and air cooler under otherwise comparable conditions. (In the free atmosphere, temperature diminishes with height: 3.6 deg. F. per 1,000 ft.)

3. *Continentality:* Away from sea

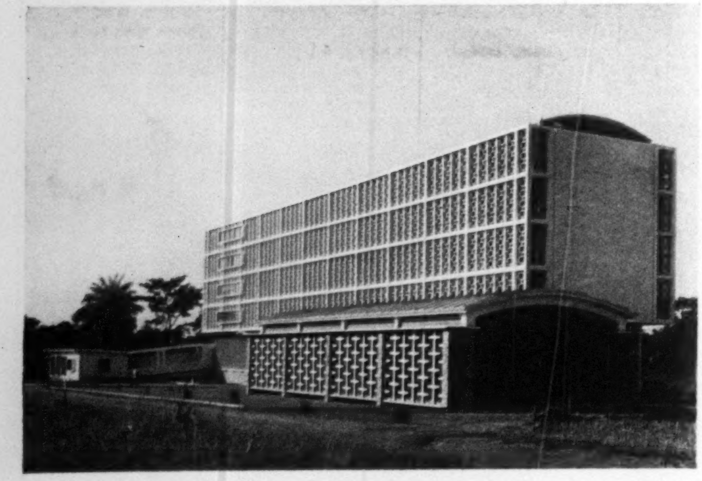
Table 1: a tentative classification of warm climates for building design

warm, humid		intermediate	hot, arid		cooler, uplands	
equatorial lowlands	tropical island, trade wind coast	tropical inland: savannah country	low latitude deserts, or semi-deserts		equatorial	tropical
			inland	maritime		
7½°N to 5°S of Equator; at or near sea level, and close to sea, large lake or river basin. Equable, never very hot nor very cold. Seasonal change may be less than 10°F. High wet bulb temperatures, average over 75°F. Air humid and often still especially at night. Heavy rainfall with rain most days of year. Cloudy skies but usually not overcast, sky therefore very bright. Abundant insect life, mould and vegetation	further north and south, and thus more seasonal. Still usually equable but more sunny and thus warmer by day and cooler by night. Humid but cooling breezes: trade winds, or off-on shore wind. Strong winds at times, especially on windward coasts; risk of cyclones (hurricanes). Wind, and particularly rainfall pattern much influenced by local topography. Blue, partly cloudy skies	inland away from Equator (5°–15° N and S). Seasonal due to latitude. Effect of altitude especially above 1,000–2,000 ft. noticeable. Less rainfall than equatorial lowlands with dry and wet season (or seasons). Total rainfall may vary from year to year. During wet season—sun overhead—conditions like equatorial lowlands; dry season, hotter by day and cooler by night. Open country—grasslands, or tropical deciduous forest	near and beyond Tropics: 20–25° N and S or, extremes, 15–30° N and S. Hottest and most arid places in world. Meagre and very variable rainfall. Absence of settlement—until recently (strategic or minerals)—except where underground sources of water (oasis); traditionally populated by nomads taking advantage of localized rains. Dry; large seasonal—may exceed 30°F.—and diurnal—20–40°F.—range in temperature. Cold at night, especially in winter. Dusty. Clear blue skies frequent. Very sunny	resembles hot arid (inland) but less extreme. High humidity, which offshore-onshore breeze only partly counteracts	altitude makes air temperature cooler, especially at night—50–55°F. Rainfall varies with wind pattern and topography. May be overcast periods. Length of day constant	more seasonal with higher latitudes. Rainfall more variable. Winter season with cool nights—may fall below 40°F.—and heating required



1, sun-protection in an office building at Ndola, Northern Rhodesia (architect, Julian Elliott)—see page 35. A projecting band of heat-absorbing glass in aluminium framing shades each row of windows. Horizontal louvres, between this band and the wall, allow hot air to escape up the face of the building.

2, a building whose architectural character is largely determined by the perforated concrete sun-screening that covers its north and south facades, permitting natural cross-ventilation: the library at University College, Ibadan (architects, Fry, Drew and Partners—see also page 18).



or other large body of water, likely to be drier with hotter days and cooler nights. May be less breeze.

4 *Annual range of temperature*[*]: Indicates how seasonal is climate Range small, little seasonal change; range large, markedly seasonal. Compare with latitude, rainfall and wind regime.

5. *Daily range of temperature*[*]: Distinguish between seasons if necessary. Range small, likely to be humid and not very hot. Range large, likely to be dry and sunny, very hot in the sun but cooling rapidly after dark in open.

6. *Rainfall pattern*[*]: Observe seasonal distribution as well as annual amount.

7. *Wind regime*[*]: Local topography has strong influence on wind pattern. Observe periods of calm, also time of day when they occur. Relate prevailing winds to rainfall pattern.

Shade

Whatever the climate, except in highlands or at and beyond the Tropics in the winter season, shade from the heat of the sun is of first importance. Anyone entering a 'wide vision' car which has been standing closed in the hot sun knows the benefits of shading. In a cool climate, we welcome the fact that ordinary glass discriminates between radiation of different wavelengths—letting in the sun's heat and light yet returning to the sky and our surroundings only a small part of the room's heat which is radiated at low temperature. But in a warm climate, there is little to be said for unshaded glass[†]—except for making solar heaters.

Shading devices—not always correctly used—have become the symbol of tropical architecture. A discussion of their design for different conditions of latitude, orientation and climate is beyond the limits of this review. Except in the early morning or the cool season, direct sunlight through windows and doors is to be avoided especially if they are glazed or the building air-conditioned. Shades should be outside the glass. North and south facing openings can be shaded with horizontal canopies which also permit windows to be kept open when it is raining. West and east facing openings, on the other hand, require vertical shades which, if fixed, screen the view and cut down the daylight. For this reason, especially, west-facing openings should be avoided.

Only in the winter season and beyond the Tropics, when the sun is low in the sky, does a roof receive less heat per unit area than any of the walls of a building. (Then, on a clear day, south-facing walls are most intensely heated by the sun.) In the summer season, though the roof receives most heat—hence the need for great care in roof design—the east and west-facing walls are the next most intensely heated parts of a building. This fact underlines the importance of siting tropical buildings with the long axis running east and west.

Air movement

When it is warm and especially when it is also humid, movement of air across the skin makes one feel cool. In a place like Singapore, where it never gets very hot or cold, a building not air conditioned is best made as open as possible to offer least resistance to light winds. But shade against the sun and protection against rain, sky glare and, probably, insects, intruders and gaze of neighbours usually makes screening necessary. It cuts down the breeze. Mechanical fans are used to move the air when the wind drops.

Especially during the late afternoon and evening, abundant fresh air is needed to keep an occupied building cool. The heat gained during the day by the structure has by then reached the interior. The wind is likely to be light (below 4 knots on an open site) and any exchange of air between indoors and outdoors is predominantly by stack effect. Webb has discussed natural ventilation under these conditions and shown how size and height of openings determine the ventilation rate. Here high ceilings or, rather, ventilators placed high up are advantageous or, better, two-storey buildings with open staircases. Away from the ground the wind is stronger, so the upper floors of high buildings are cooler.

In the trade-wind belts further from the Equator the wind blows persistently for most of the year at least on windward coasts. If a building is too open, papers and furnishings are blown about, yet for comfort some air movement is needed. It may be best to face away from the wind making the leeward side the more open.

In upland places like Nairobi and in the winter season at higher latitudes, for example in Hong Kong, a permanently open building is too well ventilated and will be too cold at times. Ventilation must be controlled. In hot, dry places like Kano it should also be under control to exclude the heat of the day and dust. But abundant fresh air is needed after sunset to cool the building. Mechanical ventilation—e.g. attic fans—helps to draw in the cooler night air.

Thermal insulation and capacity

In warm climates, the dominant thermal problem is to check the passage of the sun's heat into a building. At night, except at high altitudes and in the winter season at and beyond the Tropics, it is warmer—by up to 5 deg. F. or more—indoors than outdoors. Loss of heat is usually welcomed. Under such conditions, the heat transmission pattern is not the same as that familiar to designers in colder climates. This is true both in naturally ventilated and in air conditioned buildings though only in the latter can the effects of thermal design be costed.

First line of defence against solar heat gain is shade, particularly of roof, windows and west facing walls. Subject to practical considerations shades should be as light in weight and colour as possible. Their inside face is best of shiny metal. Where it is not practical to provide shades, the outside of a building should be light in colour to reflect the sun's heat.

Whether the main structure should be well insulated or not, should be light or heavy in weight, or more accurately has a low or high thermal capacity, depends on whether the surface is sunlit or shaded, the diurnal range in temperature is large or small, whether day-time or night-time use is the more important and whether the building is naturally ventilated or air conditioned.

[continued on page 83

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[*] These are meteorological properties caused by the first three geographical features.

[†] Though tinted glass absorbs more of the sun's heat, in so doing it heats up. It also lets through less light—but proportionately more heat—so that, although it may have a use in reducing sky and ground glare, its net effect in giving protection against the heat of the sun is slight as the users of buildings with large unshaded windows unfortunately discover. Figures giving heat reduction but omitting the coincident reduction in daylight can mislead.

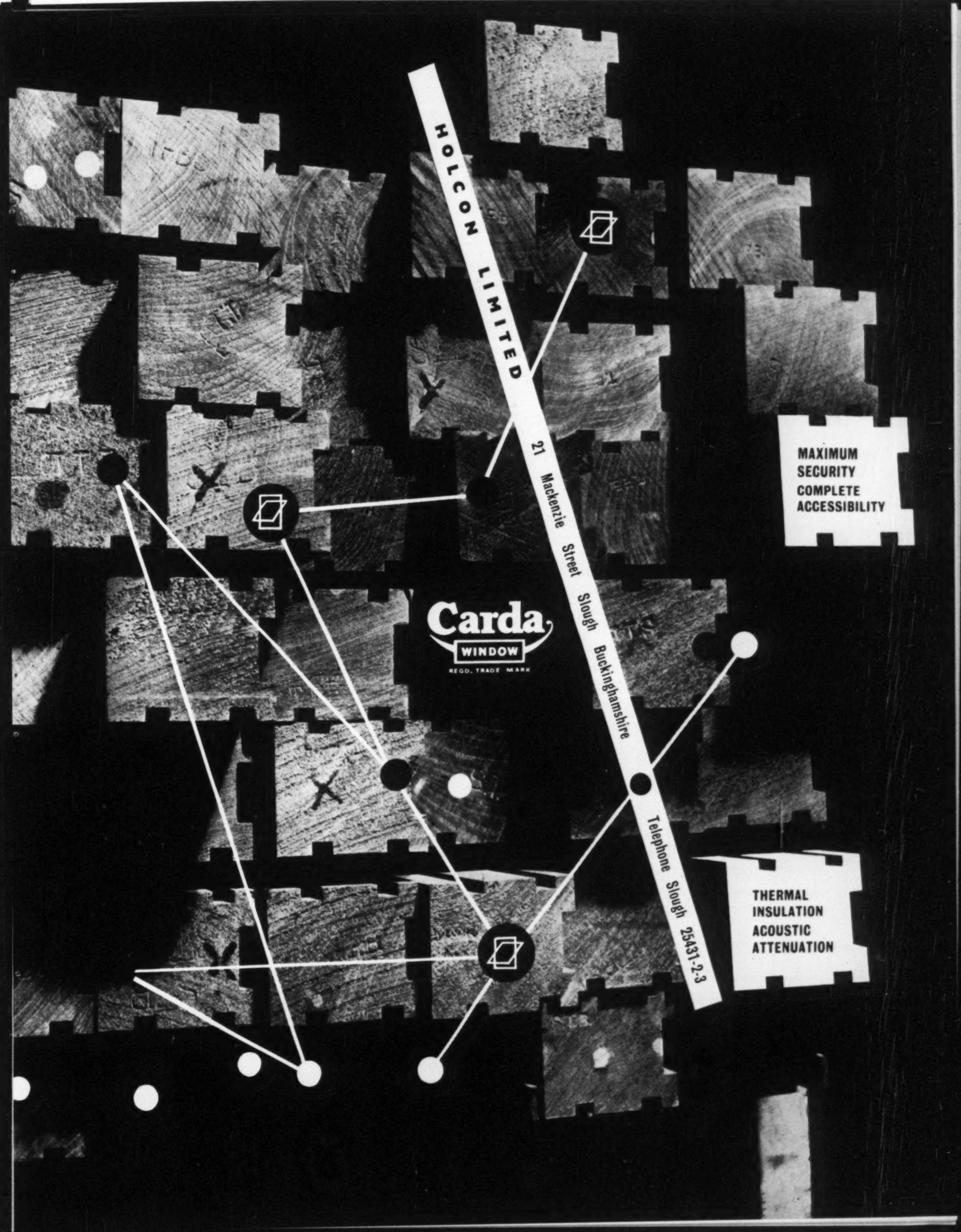

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Table 2: relative importance of thermal insulation and capacity under different conditions of climate and use

type of climate	predominant use	outside sunlit[1]		outside shaded	
		air-conditioned	naturally ventilated	air-conditioned	naturally ventilated
EQUATORIAL, *i.e. small diurnal temperature range* (average wet bulb temperature more than 75°F.)	at night	low thermal capacity, insulation not as important as vapour barrier	low-moderate thermal capacity, insulation secondary	low thermal capacity, insulation not as important as vapour barrier	low thermal capacity, insulation secondary
	during day	high thermal capacity, good or very good insulation, a vapour barrier	thermal capacity not important, good insulation	moderate thermal capacity, good insulation and vapour barrier	thermal capacity not important, insulation not important
TROPICAL, *i.e. large diurnal temperature range* (average wet bulb temperature less than 75°F.)	at night	low thermal capacity,[2] insulation not important	low thermal capacity,[3] unless night temperature low, then moderate; insulation secondary	low thermal capacity,[2] insulation not important	low thermal capacity,[3] insulation secondary
	during day	high thermal capacity, very good insulation	high thermal capacity, good insulation, best on outside	high thermal capacity, good insulation	high thermal capacity, insulation less important

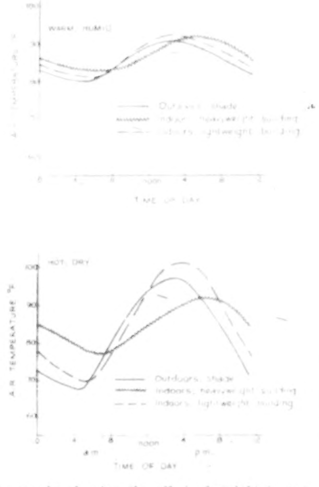
[1] white sunlit surfaces absorb little of the sun's heat and so are cooler, being next best to shade; dark surfaces, because they absorb much of the sun's heat, are to be avoided especially in sunny climates. Shiny metals reflect much of the sun's heat but cannot easily lose any heat absorbed.

[2] air conditioning not necessary, except to control noise, but for building design which prevents rapid loss of heat gained during day.

[3] when temperatures high, cooler to sleep outdoors.

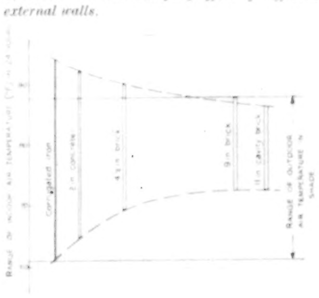
continued from page 82]

Table 2 attempts to show the relative importance of thermal insulation and capacity under different conditions. 3 illustrates the effect of weight in a warm, humid climate and a hot, dry climate. In the first, air temperature in shade varies by less than 10 deg. F. in the twenty-four hours; inside any type of building it will be a little warmer and usually a little drier at night time than in the open. A heavyweight building will be somewhat cooler until after noon but warmer in the evening, but its weight is not very important. In a hot, dry climate, however, the diurnal range may be 25–30 deg. F. and the damping effect of weight should not be ignored. (The relative damping effect of typical walls is shown in 4.) A heavy weight structure, with windows closed, will be markedly cooler until nightfall and then warmer.



3, *graphs showing the effect of weight in two different types of tropical climate.*

4, *relative thermal damping effect of different external walls.*



Artificial cooling: air conditioning

Shading and thermal insulation reduce the amount of heat passing into a building. Thermal capacity retards its passage which means that, as 3 shows, it can be cooler indoors during the day but will be hotter at night. None can make a building cooler than shade temperature over the twenty-four hours. (Normal buildings are likely to be 3–5 deg. F. warmer.) Air movement makes one feel cooler but, with one exception, cannot cool the air below shade temperature. The exception is in dry climates where the air temperature can be lowered by evaporative cooling, i.e. passing the air through a moist screen. None of these devices can dry the air; evaporative coolers make it moister—unimportant in a dry climate.

To cool a building over twenty-four hours, refrigeration is necessary, filtered air being drawn by fan over a chilled coil. Part of the moisture in the air is removed as condensate. Air conditioning practice is discussed in detail by Harrison (see page 84).

To cool a building costs possibly three times as much as to heat it volume for volume. In equatorial climates the system will be operating throughout the year. Air conditioning is, therefore, expensive. In most tropical countries it is likely to continue to be the exception rather than the rule. The cooling load should be kept down by shading and a high standard of insulation and, in a humid climate, by a vapour barrier. Sources of heat and moisture within the conditioned space should be treated at source. Building volume should be kept to a minimum and plans compact. (Buildings designed for efficient air conditioning are likely to be uncomfortable if the system fails.)

Rooms can be cooled by window units—most flexible but least efficient—by a central system; or by units serving a group of small rooms or a larger space. The last—rather similar in effect in planning as warm-air convector systems used in many post-war English schools—have the advantage of reasonable flexibility and permit the use of open and closed (conditioned) space in close proximity. (One of the social disadvantages of complete air conditioning is the creation of a barrier between its closed space and the rest of the tropical world.)

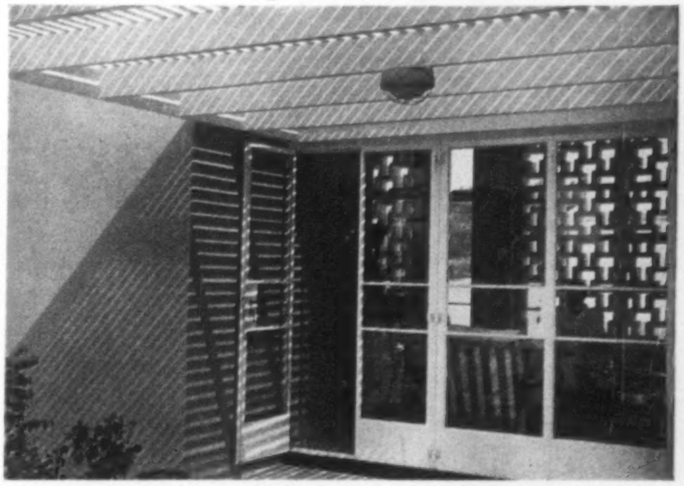
To sum up, the elements of tropical architecture are:

(i) *The open air:* too warm for living unless well shaded during the day but, particularly in drier climates, where the sky is clear, a most pleasant place to occupy at night. Importance of screens and vegetation.

(ii) *Screened and shaded open space:* open to natural breezes (and noises) but, by day, shading is needed against the bright light of clouds and other sunlit surfaces.

(iii) *Enclosed space:* closed against the heat of the day (and outside noises), a retreat—may have to be artificially cooled.

All have their place in warm climate design.



5, *in this house in the dry, arid climate of Kano, Nigeria, sun-protection is by a perforated screen covering the south facing facade (background of photograph), 3 ft. in front of the window-walls, and a wide roof-overhang on the north (architects, James Cubitt and Partners)—see also page 20.*

6, *the shading of windows by overhanging roofs and projecting walls in a school at Penang, Malaya (architect, J. R. Stewart, Public Works Department).*

Richard Harrison

AIR CONDITIONING

The author is a partner in the firm of consulting mechanical and electrical engineers, J. Roger Preston and Partners. He considers first the use of air-conditioning in the tropics, laying stress on the need to provide 'buffer zones' between fully conditioned areas and outdoors. He then considers the different methods of circulating air, the space requirements and the order of cost.

George Atkinson in his introductory article has already pointed out the importance of deciding the exact climate a building must endure. This must be a *reasonable* decision. If one selected the worst condition of dry bulb temperature and coincident relative humidity ever experienced, this would be absolutely safe and the plant designed on this basis would never fail to maintain the required inside condition. Such a plant would, however, be very extravagant because it would virtually never be used to its full capacity, and in practice it is always found more difficult to operate a plant satisfactorily at partial duty than at a condition approximating to its full duty. Furthermore the thermal fly-wheel effect of the building construction will tend to smooth out the effect of short term peak conditions so that they are not really felt inside the building. The selection of the outside design condition is therefore a matter of judgment to ensure satisfactory performance under normal maximum conditions while achieving the utmost economy in plant.

Table 3: external design conditions for Hong Kong
Lat. 22 deg. N. Long. 114 deg. E.

general
(data obtained from Royal Observatory)
meteorological results 1949 to 1953; meteorological records 1884 to 1950

hottest months: July, August
coldest months: January, February
absolute maximum: August 1900, 97 deg. FDB (dry bulb)
absolute monthly mean maximum: August 1933, 89.5 deg. FDB, 76 deg. FDP (dew point)
monthly mean maximum: 60 years, 86.7 deg. FDB, 74 deg. FDP
diurnal range: hot months, 8.8 deg. FDB, 2 deg. FDP

analysis of results

		FDB				FDP			
		90	91	92	93	78	79	80	81
June	1949	4	1						
	1950	1							
	1951	1							
	1952	9	2	1					
	1953	5							
July	1949	6	2	1		19	14	1	
	1950	6	4	3		8	11	6	
	1951	5	1	1		10	11	3	1
	1952	4	4			9	8	9	1
	1953	9	6	2		10	14	4	
August	1949	4	1			14	11	5	1
	1950	2	2	1		15	4	3	
	1951	4				9	4	5	3
	1952	3	1			17	4	1	
	1953	5	3	4	2	6	4	6	9

summary

no. of days over

FDB				FDP		
90	91	92	93	79	80	81
22	8	3	0.5	27	12	3

proposed external design temperatures

90 deg. FDB, 79.5 deg. FDP, 82 deg. FWB (wet bulb)

The basis of the selection must be the meteorological data for the particular area. Most countries publish printed data based on Observatory readings, and where such printed data exists it is best to use it in the standard form in which it is provided. It must be remembered, however, that strictly the data is only accurate for the location of the Observatory and may not be entirely valid for the surrounding locality, e.g. conditions near the coast may be more humid than those at an Observatory some miles inland and possibly on a hill.

Another source of reliable data is the local airport, though this again is probably some miles away from the town. Failing these, data can often be obtained from oil companies, from contractors working at a particular site and so on, and in the last resort it will be necessary to set up a station and obtain data for the particular site.

As an example of the use of the data obtained, Table 3 is abstracted from the published data of the Royal Observatory, Hong Kong. The table shows that there are on average:

1 day in two years when maximum temperature reaches 93 deg. F.
3 days per year when it reaches or exceeds 92 deg. F.
8 days per year when it reaches or exceeds 91 deg. F.
22 days per year when it reaches or exceeds 90 deg. F.

It will be seen that temperatures over 90 deg. F. are of infrequent occurrence and it can be ascertained from the detailed records that they are also of short duration. Accordingly 90 deg. F. might be selected as the outside design dry bulb temperature, and with this figure there would be only 8 days in an average year when the internal condition must be allowed to rise (1 deg. F. to 3 deg. F.) due to excessive outside temperature. This expedient is quite permissible and probably desirable. Similarly the dew point corresponding to the design day can be selected on the assumption that the maximum dew point occurs on the hottest days. A figure of 79½ deg. F. dew point corresponds to a convenient wet bulb figure (82 deg. F.) and this is selected.

The accompanying figure, 7, shows on a psychrometric chart zones embracing the recommended outside summer design conditions for many parts of the world, based on data from various authorities. It will be seen that the highest temperature within this zone is 115 deg. F. (and very dry) and the highest wet bulb is approximately 84 deg. F. at a fairly low dry bulb temperature. On the same chart has been shown the approximate zone of required internal conditions, which is naturally much more restricted in range than the external ones. As reference points the usual internal and external design points for London are shown connected by a line.

As to the inside condition, the selection may be considered under the following heads:

(*a*) Type of person using the building. If the occupants are foreigners it might be thought that the requirements for equal comfort would be somewhat different from those of people native to the locality, but in fact there does not seem to be any definite evidence that this point of view is valid; increasing residence of Europeans in the tropics has shown that they are as adaptable to the conditions as are the native population, and are able to work just as hard in reasonable comfort. The age, sex, general condition of health, amount of clothing, acclimatization and mental outlook are important factors whether the subject is native or foreign. There must, of course, be upper limits to the condi-

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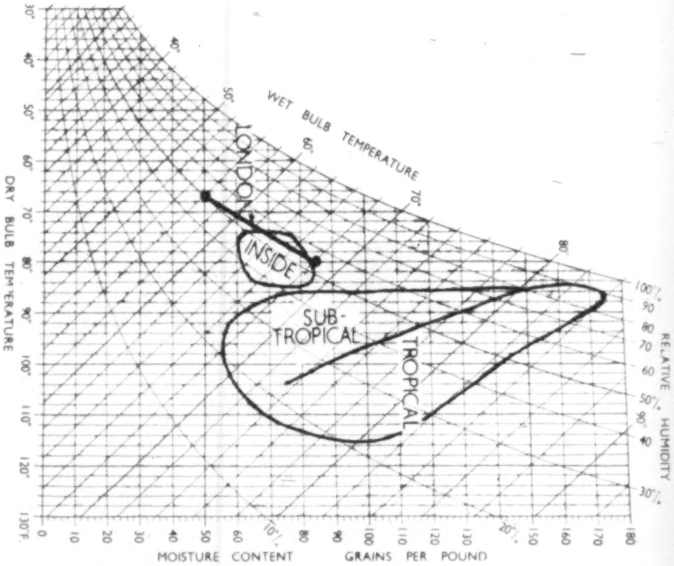
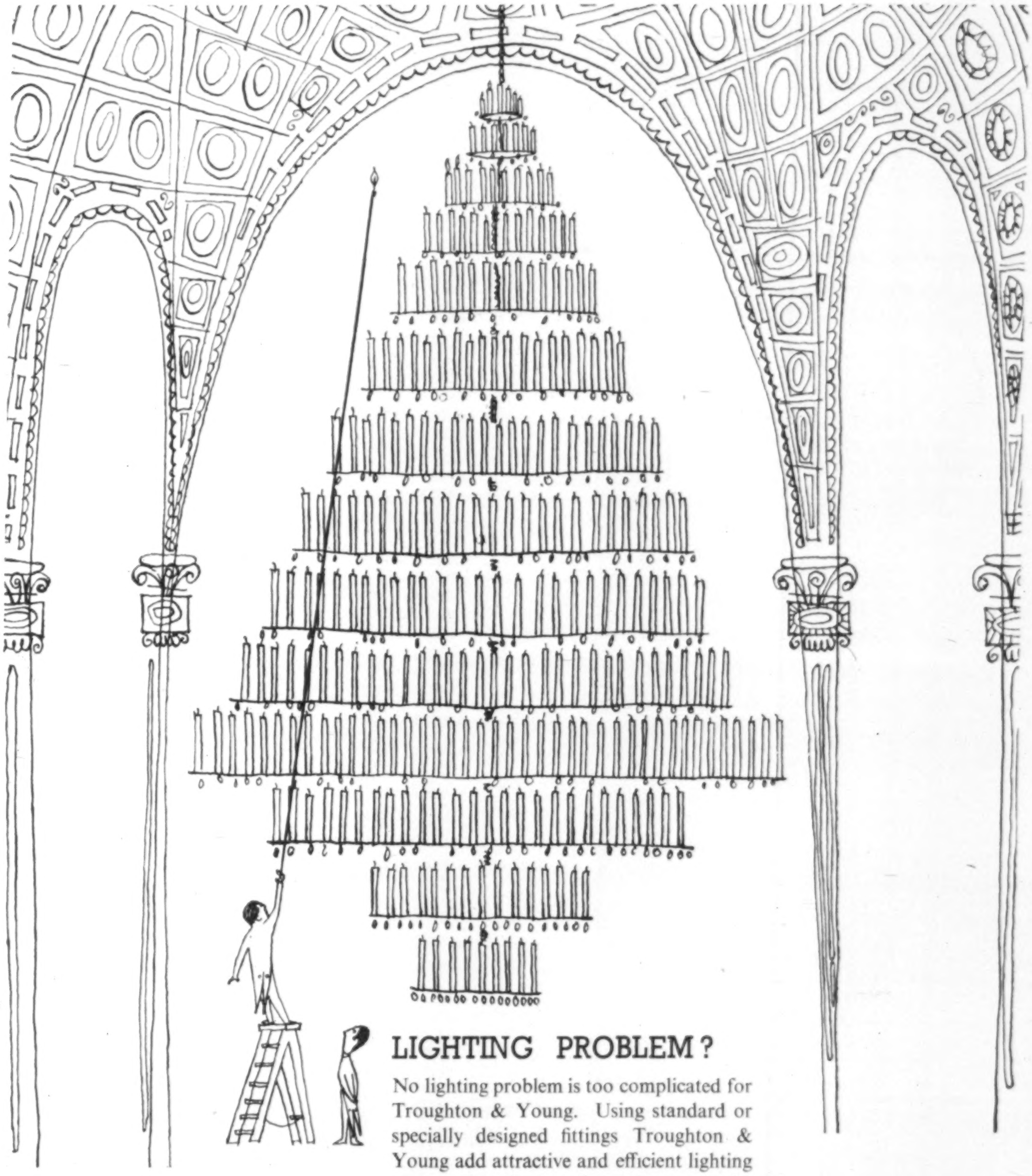


7, psychrometric chart showing zones covering recommended outside summer design conditions.



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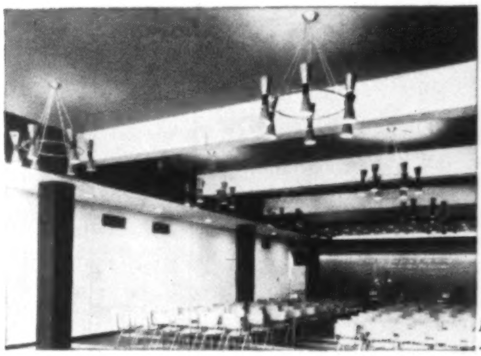

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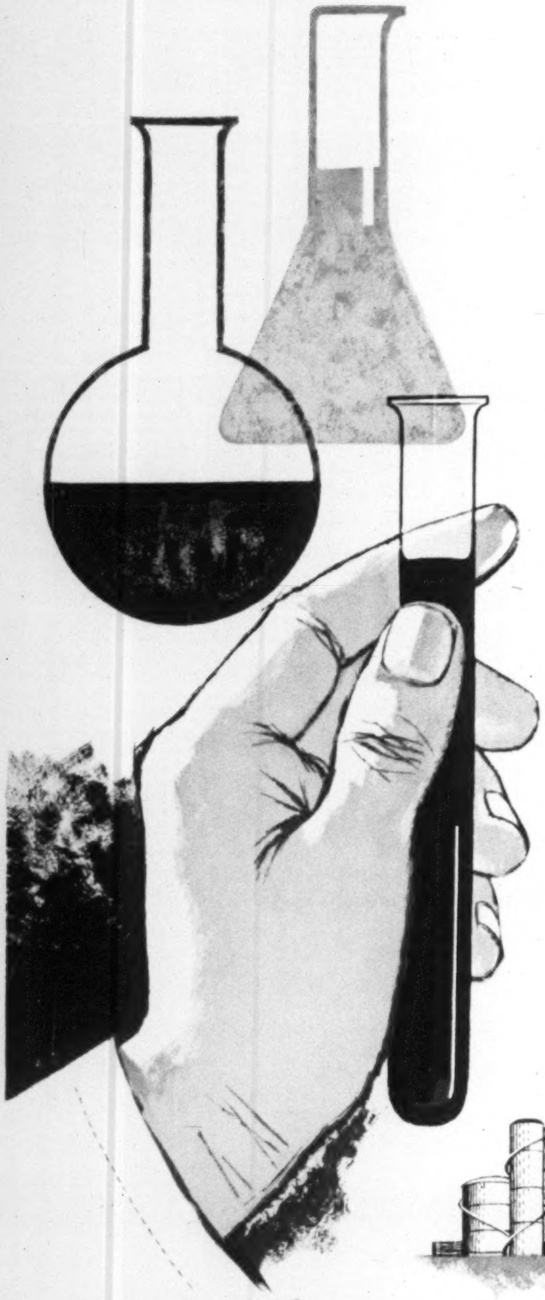

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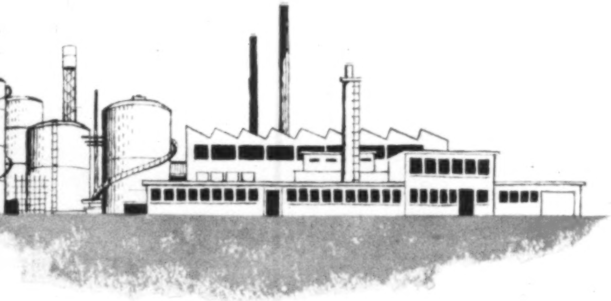

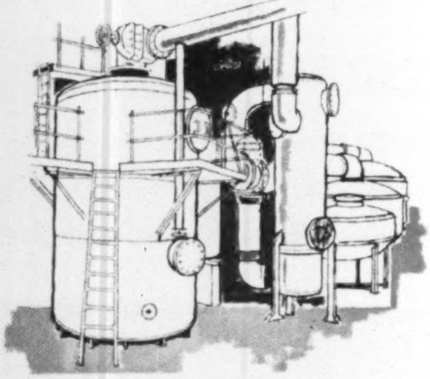

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tions in which a person can work, and the efficiency of persons doing mental work shows a marked falling off at high wet bulb temperatures.

(*b*) Period of occupancy. There is no doubt that whatever the age or physical condition of a person he will feel a physiological shock on entering or leaving an air-conditioned space. It appears to take about 10 to 15 minutes before the body settles to a state of equilibrium, and during this period a person feels chilled often to the point of shivering. This is obviously of importance where occupants are entering and leaving within a short time, and the nature of occupancy should be carefully ascertained when selecting the inside design condition. In the typical case of the public hall of a bank, the customers may be indoors for perhaps 5 to 30 minutes, and in such a case it is best not to aim at complete air-conditioning in the public spaces but to allow the temperature therein to be at some point intermediate between that of the offices and cashiers' space, and that outside.

For continuous occupation, it is permissible, in the author's opinion, to design for an inside temperature of 27 deg. F. to 30 deg. F. below the outside design temperature, subject to the entrance zones and corridors of the building being put to best use as 'buffer zones' and being maintained at some temperature intermediate between that of the inner zones and the outside. At times when the outside temperature rises above the design condition then the inside temperature should certainly be raised correspondingly.

(*c*) The nature of the work done by the occupants has a fundamental effect upon the amount of heat and moisture which they emit, and both these must be taken into account in the air-conditioning calculations. In any case it is desirable to maintain somewhat lower temperatures in spaces where physical work is being done, than in such spaces as a cinema or hotel lounge.

(*d*) There is also a psychological effect upon the occupants of the size of room, amount of glare from windows, intensity of light and so on, which have been dealt with by other contributors.

The selection must therefore be a compromise, setting the maintaining of pleasant (i.e. cool and dry) conditions against the cost of the air-conditioning plant to achieve them, and subject to the temperature difference between inside and outside not being too great. Table 4, taken from the Institution of Heating and Ventilating Engineers' Guide to Current Practice, gives recommended internal summer design conditions for tropical climates. Since design conditions above 100 deg. F. will seldom be found associated with a design R.H. above 45 per cent, the recommendations in effect take separate account of hot humid and very arid climates.

Air circulated

The air circulated is introduced into the conditioned space at a temperature and humidity below that required, and by picking up heat and moisture in its passage it acts as a vehicle for the removal of the gains. The difference between the supply-air temperature and the room temperature is usually about 12–20 deg. F. in tropical installations. The greater it can safely be, without causing draughts, the less the quantity of air required to be circulated.

Most of the air is recirculated through the system, fresh air being introduced from outside only to the extent necessary for breathing, except that in cases of sparse occupancy the proportion of fresh air introduced should not be less than 10 per cent of the total air circulated so as to maintain a positive pressure within the building and so minimize the infiltration of unconditioned air from outside.

The absolute minimum required for breathing is about 600 cubic feet per person per hour, but it is recommended that this figure should be increased to not less than 1,200 and preferably more.

The design of the air-conditioning plant should be such that the proportion of fresh air may be increased to take advantage of those periods when the outside air is at such a condition that it can be used direct to do cooling, thus reducing the period of use of the refrigeration plant.

In most buildings the differing incidence of the solar radiation during the day will cause wide fluctuations in the internal temperature unless steps are taken to obviate this. Large air-conditioning installations are therefore invariably divided into zones each with their own controls and each serving a portion of the building of like aspect. For small buildings one plant may be used for several zones delivering air at a basic condition, and with separate re-heaters for each zone. This is not an economical arrangement in all cases since all the air must be cooled to its lowest condition, and a large part of it then reheated.

Another method and one which gives the individual occupant control over the conditions in his own room is the use of a double-duct system consisting of two supply ducts, one fed with air at a fixed minimum condition, and the other with warmer air; each room then being provided with a blender or mixing device of some kind taking part of its air from each duct. This system lends itself well to the supply of air at high velocity since the blender can be in the form of an acoustically-lined cabinet (usually under the window) with grilles discharging the mixed air into the room.

Another application of high velocity systems is to introduce the fresh air only, into the room, through a cabinet containing nozzles so arranged as to induce a secondary circulation of air from the room, and to mix it with the primary air supplied by the duct. Such units require additionally a heating/cooling battery supplied with warm- or chilled water according to season, so as to temper the air supply. This system, however, has the disadvantage that both ducts and pipes are required to each unit, and while it is simple in its arrangement it is not as economical in operation as other systems in the intermediate seasons. It is also not possible with this system to do heating with one unit and cooling with another since the water supply is either warm or chilled and must be changed over on a specific day.

High velocity systems have the great advantage of keeping duct space to a minimum. For instance, a main duct to the floor of a building might be 10 in. diameter instead of 24 in. by 12 in. This is a considerable advantage from the architect's point of view. On the other hand the sound-absorbing units which are a necessary part of high velocity systems will occupy additional space; and from the purely engineering point of view the standard of ductwork, etc., must be very high if air leaks are to be avoided. In addition the running cost of such a system is relatively high due to the increased fan horse-powers required.

Table 4: recommended internal summer design conditions for tropical climates

	external design conditions	internal design conditions	
		for continuous occupancy	for transient occupancy (15-30 min.)
dry bulb temperature (deg. F.)	above 100 deg. F.	78 deg. F. to 83 deg. F. (a)	80 deg. F. to 85 deg. F. (b)
	below 100 deg. F.	74 deg. F. to 78 deg. F.	76 deg. F. to 80 deg. F.
relative humidity at design condition	above 45 per cent	not to exceed 60 per cent	
	less than 45 per cent	not to exceed 50 to 55 per cent	

Notes

(a) for continuous occupancy (over 30 minutes) it is recommended that the difference between external and internal design dry bulb temperature should not exceed 27 deg. F. to 30 deg. F.

(b) it is recommended that the difference between the external design temperature and that in the space, should not exceed 20 deg. F. For such spaces as corridors and entrance halls where the occupants are passing straight through into a fully conditioned space the temperature in the corridor, etc., should be approximately midway between that outside and that of the conditioned space.

The cost of a high velocity air-conditioning system from the plant point of view is not much different from that of an orthodox system, but in the overall cost, account must be taken of the value of space saved, the greater height sometimes available due to the less depth of sub-ceilings required to conceal ducts, and so on. The refrigeration plant itself is the same, both as to cost and space, for either system.

For smaller installations or those in existing buildings where structural adaptation is difficult, the self-contained room unit is often used. It consists of a small compressor with its own evaporator and condenser coils, air filter, fan, and inlet and discharge grilles, all enclosed in a cabinet which may stand on the floor or be mounted at the bottom of the window opening. All the heat removed from the room must be disposed of through the condenser, which may be air-cooled or water-cooled. In the former case outside air is used and an additional quantity of outside air may be drawn into the room through the unit. The self-contained units are convenient in certain cases but due to their cost and to the fact that an electrical supply and usually a drainage point is required for each, they do not lend themselves to extensive installations.

Cost of installations

It is impossible to give any hard and fast rule for the cost of installations related to the cubic content or floor area of the building due not only to the great variation in building construction but also in localities and orientations. It is difficult even to

Table 5: space occupied by air-conditioning plant

building	floor area of plant spaces as a percentage of gross area[1]		
	refrigeration plant	air-conditioning plants	total
tropics			
public building	4.6% [2]	5.0%	9.6%
do.	3.1% [3]	9.2%	12.3%
air terminal	2.9% [6]	3.2%	6.1%
bank building	3.0% [3]	2.8%	5.8%
do.	2.4% [4]	4.7%	7.1%
office building	9.0% Total[7]		9.0%
United Kingdom			
public building	1.4% [5]	4.7%	6.1%
office block	3.6% [5]	10.7% [8]	14.3%
electronic equipment building	9.0% [3]	8.0%	17.0%

Notes

[1] gross area includes staircases, duct risers, tank spaces, etc., as well as the AC plant spaces.

[2] plus cooling towers on roof.

[3] includes cooling towers on roof or in open compound.

[4] includes economizer-condenser.

[5] includes cooling-towers.

[6] plus sea-water-cooling pumping plant.

[7] self-contained air-conditioning plants with cooling tower on roof.

[8] includes calorifiers, etc.

General

boiler plant, fuel space, tanks, heating equipment, fire pumps and electrical equipment (other than AC starter panels) excluded in all cases.

give a rough guide, and any rule of thumb, while it may help to visualize the magnitude of the problem, can be dangerous as a basis for final conclusions. However, as a first approximation the air-conditioning load will be of the order of 1 ton r. for every 2,500 to 4,000 cubic feet of an ordinary building. (One ton of refrigeration, originally derived from the heat absorbed by the melting of a short ton of ice in 24 hours, equals 1,200 btu/hour extracted.)

As to the cost of the installations these vary widely in different parts of the world. Costs as small as £200 per ton and as expensive as £700 per ton or more are met, but at a figure of £450 to £500 per ton the cost works out at about 3s. per cubic foot of conditioned space. Each case must certainly be considered on its merits and calculations made to a reasonable degree of accuracy before a realistic estimate can be made. In this connection it is most important that there should be close collaboration between the architect and the air-conditioning engineer from the very first so as to ensure on the one hand that the design and building construction lend themselves to air-conditioning as far as possible, and on the other that the air-conditioning installations selected are the most suitable for that particular building.

Space required

The planning of the building must take account of the space requirements of the air-conditioning equipment, under the following heads for a central chilled water system:

(*a*) Cabinets under the windows or elsewhere: and/or diffusers and grilles in walls or ceilings.

(*b*) Ducts and/or pipes serving the air-supply and extract points. These may involve sub-ceilings, particularly to conceal the main duct-runs in corridors; and casings to conceal the main rising ducts. Access is required to dampers, control instruments, etc., in the ducts. All supply-air ducts, and sometimes the recirculation ducts, should be insulated, and may have to be acoustically treated, also.

(*c*) Trenches and risers for the chilled-water piping between the refrigeration plant and the zone-plants. Electric wiring and cable runs for the motive and control circuits for these plants.

(*d*) Space for the zone-plants themselves, with fresh-air intakes and outgoing ducts. Access to all such spaces, for plant removal and for maintenance.

(*e*) Central refrigeration plant room, which preferably should be separate from the main structure, but in any case should have solid foundations for the heavy plant. Good access with provision for lifting. Space for engineers' stores and minor workshop.

(*f*) Cooling of the condensers: in some localities this may be by the use of water from lake or sea, requiring pumping plant and mains. Otherwise by some form of forced-draught evaporative cooling towers, located on the roof of the building or of the compressor-room, or separately in the open air.

A recent development is a tendency away from large central refrigeration plant in favour of packaged zone plants each with their own compressor, on the grounds of flexibility and elimination of extensive chilled water circulations. Each such compressor plant would, of course, have to be provided with a supply of condenser cooling water (or have an air-cooled condenser) and vibration problems might be encountered.

The amount of space occupied by the plant will vary greatly depending on whether the spaces available lend themselves to the plant layout; on the use of the building and its subdivision, e.g. an air terminal consists of large undivided spaces, whereas an office building has a large number of small rooms. Table 5 gives some idea of the space occupied by the plant in some recent fully air-conditioned buildings in the Tropics, with a few United Kingdom examples by way of comparison.

Tom Ridley

DESIGN OF CONCRETE

Many architects working in the tropics have had to accept disappointing concrete work. The author of this article, Tom Ridley of Ove Arup and Partners, describes the causes of poor results—high temperatures, variable humidities, badly graded aggregates and cement which has been kept too long—and advises how all can be overcome.

The effect of climate on the properties of concrete is chiefly through the influence of temperature and humidity. In tropical climates the daily maximum shade temperatures may often be as high as 95 deg. F., and the out-of-shade temperature under which concrete production is often carried out may reach 110 deg. F., or more. Humidity will usually vary with the change of seasons, and may be as high as 95 per cent relative humidity, or as low as 65 per cent.

During recent work in West Africa it was observed that the high temperature of mixing and curing had the effect of reducing the 28-day strength of concrete by approximately 15 per cent.

The rate of strength gain of concrete under these conditions is more rapid in the early ages up to seven days, but this rate of gain at later ages is much reduced. This means that the proportion of 28-day strength achieved after seven days may be as high as 85 per cent, the exact figure depending on the type of mix being used. This proportion compares with a value of approximately 70 per cent under the climatic conditions in this country, and thus considerably influences any predictions made of the strength of 28-day concrete cubes from the 7-day figures.

When high strength is required for prestressed concrete work, the concrete mix proportions need to be carefully designed. As a result of the reduction in strength due to high temperature, a special allowance must be made in mix design for this type of concrete in the Tropics. The result of this is usually the need to adopt a lower water/cement ratio to give the increased high strength required, with a consequent deterioration in the workability of the concrete. To overcome this effect a cement of special strength characteristics can be used, i.e. rapid-hardening; which gives an increased rate of hardening at early ages, and also increased 28-day strength of sufficient amount to permit an increase of the water content. The use of a 2 per cent addition of calcium chloride, by the weight of cement, has also proved to be advantageous in this respect when ordinary cement is being adopted. An increase of up to 25 per cent of 28-day strength has been obtained when compared to mixes without the calcium chloride addition.

For concrete mixes to be used in normal reinforced concrete work which has been designed to the current Codes of Practice used in this country, a cube strength of more than 5,000 lb/sq. in. is not usually necessary. A reduction of water/cement ratio in this case, and the resultant deterioration of workability, can be overcome by using a slightly increased cement content. This means that to achieve the desired concrete strengths for this type of work the contractor must be allowed some scope within the specifications to combine adequate workability with the use of specially proportioned mix for this purpose. If strength is used as the sole criterion for the concrete mix, this may have the bad effect of making compaction in the formwork extremely difficult with possible poor finishes and much bad temper all round!

A suggestion for this type of work is to make the concrete specification one which stipulates the required strength values and the minimum cement contents per cubic yard of the mixed concrete. A special clause can be inserted within the specification and schedules to the effect that the actual cement contents for the work will be agreed with the contractor on site, after the concrete mix proportions have been chosen. The choice of mix proportions will normally be made from the results of preliminary trials, or if sufficient experience is available, by recommendation. This procedure is one which should result in satisfactory concrete being made from all points of view, and any variation in cost of the work will be very small.

Local materials

In many tropical countries there are no satisfactory supplies of good quality concrete aggregates available ready for use as a commercial product. It is therefore necessary to accept the supply of the best local materials, and deal with the problem of improving their quality on site. This will usually involve careful washing out of all vegetable matter and clayey soil, together with the grading of particle sizes to conform with the desired standards. The influence of the size, shape and grading of the aggregate particles has a considerable effect on the type of concrete which is made from them, and especially on the workability. As mentioned previously the question of workability is one which has to be taken into account in the strength calculation of mix proportions, and for this reason particular attention should be given to aggregate properties in the Tropics. With the reduction of water/cement ratios as proposed, improvement in workability can often be made if the aggregates are carefully prepared for this purpose.

Coarse aggregates most frequently are obtained from native 'quarries' where crushing of the stones is not sufficiently well supervised to give good gradings. Excessive dust and inconsistent sizes result in a coarse aggregate which has the effect of gap-grading with the fine aggregate. This can result in honeycombing of the concrete unless the mix is very carefully chosen and supervised. Natural gravels are also found frequently, in land and water borne deposits. These suffer normally from containing too much fine material, which can result in harsh concrete giving poor finishes. On the other hand the sand can often be of excellent potential quality, and when washed will be a first class aggregate, of the type which is sharp but well graded.

The supply of cement is most often of imported origin, but in several tropical countries cement factories have been recently constructed. With imported cements there is always some doubt as to quality because of the increased age since manufacture due to the time taken in shipment. Deterioration can take place as a result of contact with moisture, or the method of handling and packing which damages or punctures the containers. Tests have shown that provided the containers are in sound condition the quality of cement is well within the requirements for quality cement work, and that storage of the cement can be carried out for several months. For periods of storage over three months it is advisable to use a special type of waterproof paper sack, which can be obtained from most suppliers at very little increased cost. For periods of storage over six months the use of a steel drum which has been sealed from the atmosphere is to be preferred, and tests on cement stored up to 18 months in this way have shown no signs of deterioration.

Site control methods

The methods used for manufacturing concrete on site must be arranged to give the desired results to fulfil the design requirements, without regard to the total size of the job or the amount of concrete being made at any one time. This is a general stipulation, and the methods are concerned with the batching, mixing, placing and finally curing the concrete. They are chiefly the concern of the contractor for the work, who is usually sympathetic towards the

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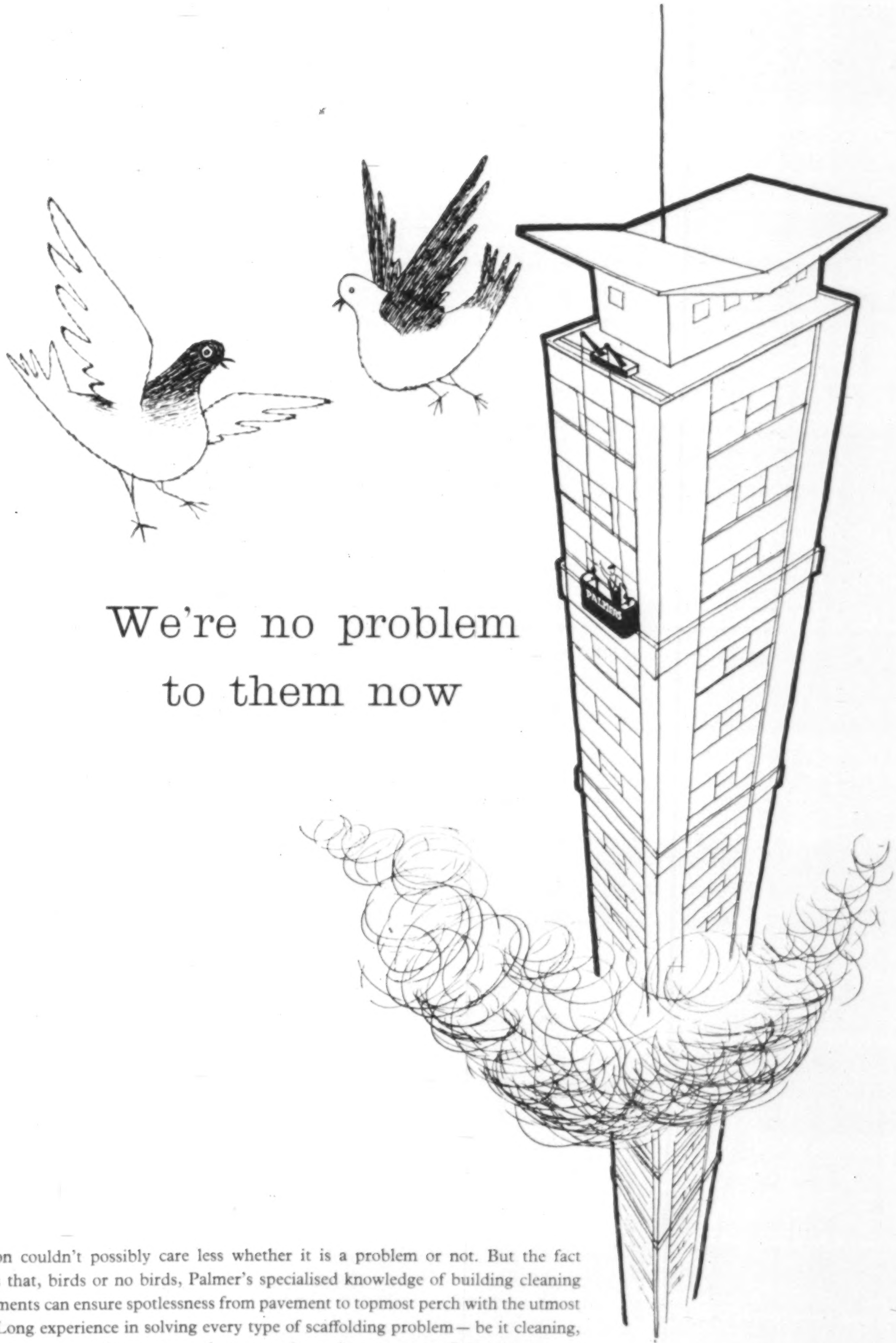

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idea for first-class results within the scope of the contract. The control methods to be adopted in order to achieve the desired results can frequently give savings in materials, especially with cement, and thus there can be a financial incentive. In tropical countries this is more so as the cost of cement is very high, and the cost of labour relatively low.

The effect of tropical climate conditions on site control methods for quality concrete arises chiefly through the increased attention which must be paid to the question of water content at the mixer. High mixing temperatures give rise to rapid evaporation from moist aggregates, and from the batches of mixed concrete before placing; which means that the control of workability is a tricky operation within the strict limits of water content derived from the strength requirements. To limit the effect of the direct rays of the sun it is desirable to place the concrete mixer and adjacent aggregate stockpiles during mixing under a roof shelter. This can be made from temporary materials without any difficulty, and also proves very useful in helping to keep the moisture content of the aggregates constant even during sudden tropical rainstorms.

A procedure which has been successfully adopted on larger jobs to control water content is one which involves drying out samples of the aggregates prior to each mixing. The results from weighing the amount of water contained in each aggregate are used to calculate the correct batching proportions from the dry weight proportions chosen in the preliminary mix agreed for the job. A simple form of nomograph can be designed to make these batching calculations automatic, and the work involved in applying this method of control is not inconvenient. It has been found that the batching of water by weight is to be preferred to the various ways of measuring it by volume, and a very simple form of lever balance can be obtained for this purpose.

The method of conveyance of the mixed concrete, and the method of placing, will always vary from one job to another. With the form of sun shelter described above, the mixer is not able to move freely about the site, and the distances to be covered in transporting concrete into position can be large. In this case a method of covered skip or dumper is to be preferred which will retain the concrete in its properly mixed condition, without loss of workability or segregation.

Curing of concrete in tropical climates is something which needs a considerable amount of attention, due to the rapid evaporation as the concrete is hardening. For vertical surfaces such as walls it is necessary to keep up a continuous spraying of water, particularly if steel shuttering has been used. For horizontal areas such as slabs the best method of curing is by ponding, in which the slab is covered by a layer of approximately 3in. water. Alternatively hessian covering and shading, with continuous watering, can be equally successful. Due to the increased rate of strength gain under high temperature conditions, the stripping of formwork may be possible sooner than expected in this country. However, it is not desirable to reduce the periods required before stripping as the formwork provides a protection to the concrete surfaces which should be maintained. In certain cases surface cracking may result if rapid drying out of the concrete takes place due to too early removal of the formwork.

Scope of application of quality concrete

The results of concrete cube tests in tropical climates show that strengths up to 8,000 lb. sq. in. are obtainable with no more than the usual amount of control adopted in this country. The selection of concrete mix proportions has been shown to require that certain allowances be made for the prevailing high temperature conditions, but with these allowances there is every reason to expect first class concrete structures well up to the standards achieved elsewhere.

W. H. Ransom

NEW MATERIALS

*The author of this last article, W. H. Ransom of **BRS**, describes the taxing conditions which building materials must stand up to in the tropics. He then takes a selection of characteristic new products: polyethylene, pvc, translucent corrugated roof sheets, polystyrene, wood particle board, paper resin laminates, pva emulsions and pitch fibre—and states in what conditions each can be used.*

Building materials will, initially, possess certain desirable properties. They may be strong and resistant to impact and fire; they may be elastic and have the ability to adhere to other materials; they may be waterproof and of good appearance. When exposed to the weather under normal working conditions these initial properties can change. Then the material may corrode and become weaker; it may embrittle, fade and discolour. Obviously it is an advantage if the probability of such changes can be forecast. In the Tropics, however, many of the materials to be described are very new and there are few relevant laboratory results specific to the

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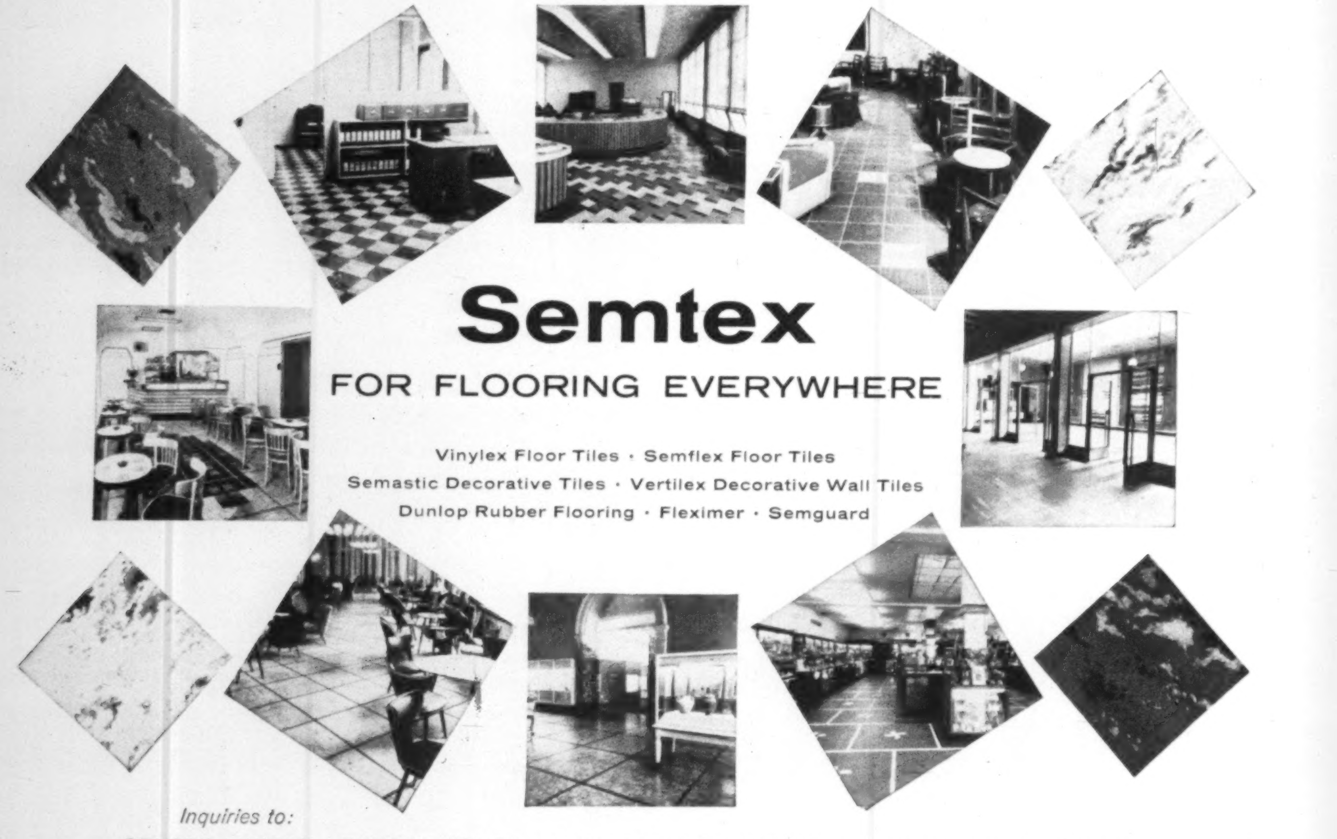

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At the same time it is not often fully realised that daylight — the most generally accepted form of illumination — does vary in quality, and although the variations in the quality of daylight in different places and different parts of the country are small, such differences may often play a decisive part in the selection of the various colours.

There does not seem any doubt that the daylight of the industrial north of England, particularly near the sea, possesses an excess blue component compared with the urban daylight of late afternoon and evening. The colour of the gentian flower sparkles in the south of England because the red component of this colour is reflected into the eye of the observer, whilst in the north the relative absence of the red component makes the colour appear lifeless and dull.

Generally the most suitable colours for the northern light are the pastel colours of high reflection value which can be used together with white and a whole series of greys, again of high reflection value. If interest is then obtained with small areas of strong colour then satisfactory decoration can be achieved. The choice of the hue of the pastel colour needs care in selection, but it has been found that the pastel reds and the yellow-reds do give pleasing results, although any basic colour, reduced as a pastel, can be used. In the south, on the other hand, the whole gamut of the colour range can be fully used.

The next announcement in this series will be on " Glare ".

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COLOUR

continued from page 88]

climatic conditions. Even so some useful guidance on probable behaviour can now be given though some of the remarks made in this article will, no doubt, need to be modified in the light of future practical experience.

The factors that cause detrimental changes in a material are often present in both tropical and temperate areas. It is primarily the variation in the degree of intensity of these factors which is responsible for any differences in behaviour in the two climatic regions. The essential difference lies in the much higher levels of solar radiation—both light and heat—received in the Tropics. Because of absorption by cloud and dust, solar radiation received at the earth's surface is a maximum, not at the Equator, but between latitudes of 15 and 35 degrees both north and south of the Equator. (The world's highest shade air temperature of 136 deg. F. was recorded at Azizia on latitude 32½ degrees N.)

The surface temperatures attained by building materials by day are greater than the corresponding shade air temperature. Then a dull or black surface, especially if insulated underneath, may well be some 50–60 deg. F. hotter. Moreover, at night it can fall below air temperature when the atmosphere is clear with little moisture or dust. High temperatures in themselves can cause fundamental changes within materials—particularly in the organic materials, bitumen, paint, plastics and rubber—changes which are manifested by embrittlement. Volatile constituents—e.g. paint driers—will be lost more rapidly and premature evaporation of water from cementitious mixes will result in poor hydration and hardening. Furthermore, high temperatures have the secondary effect of stimulating biological activity and increasing the rate of other degradation reactions both of which are detrimental to many organic materials. Fluctuations in temperature cause thermal movements of materials. These impose differential stresses upon different materials used in conjunction with one another and even within a homogeneous material through unequal heating of the surface and underlying layers. These stresses can cause crazing, cracking and distortion. This is most marked when changes are large and rapid—for example, in hot, desert areas where diurnal temperature variations are high. In equatorial rainforest areas changes are much smaller and may well be less than in temperate regions. Quite apart from any heating effects, the shorter wavelengths of sunlight itself can be absorbed by bitumen, many paints, plastics and rubber. Embrittlement, crazing, and discoloration are caused, the effects being most pronounced at high altitudes and in coastal areas.

Moisture is detrimental to most building materials. Deterioration is most likely in equatorial rainforest areas where humidities are so high that the small drop in surface temperature of a material at night frequently results in heavy condensation upon it. Even when stored under cover building materials can then be thoroughly wetted. They may corrode or rot particularly when condensation occurs in relatively inaccessible crevices from which subsequent evaporation is slow. Prolonged high humidities, too, are conducive to mould and algal growth. At the best, building surfaces are disfigured; at the worst, decay can result. Tropical savanna regions have markedly wet and dry seasons and the annual range of relative humidity can exceed 90 per cent; the daily range can be greater than 70 per cent. Such extreme fluctuations of humidity cause marked dimensional changes of many building materials—notably of timber, boards, earth, and cement products. Warping, splitting, crazing and cracking can result.

Rainfall amounts in tropical areas vary widely but in general terms the wettest areas may be said to be between 10 deg. N. and 10 deg. S. Here annual totals commonly exceed 60 in. and may exceed 100 in. High intensity falls of 2–3 in. per hour are not uncommon during storms. High total rainfall and high intensity falls keep humidities high, cause the prolonged and thorough wetting of materials, and can erode the softer ones. Tropical convective hailstorms can be severe and even material such as concrete and clay tiles, asbestos-cement and thin gauge aluminium sheets can be broken by hailstones which at times weigh over ¼ lb. Paint films, too, can be damaged.

Damage by insects to building materials is chiefly caused by the termites, whether earth-dwelling—where contact with the ground is vital to their life—or wood-dwelling—where no such contact is needed. Both types feed on timber, fibreboard, hardboard, and some plastics and can damage bitumen, paint, rubber and earth in their search for food. Termites are widespread and cause much damage where remedial measures are not taken.

Damage through atmospheric pollution is generally less in the Tropics than in the more industrialized temperate areas, but in hot, desert areas wind-blown grit can etch glass and erode paint films. Near surf beaches, too, the high concentration of sea-salt in the atmosphere degrades paint films and promotes the corrosion of metals.

Plastics

Plastics figure prominently amongst the building materials most recently introduced into the Tropics. Of the many types now available special mention must be made of polyethylene, polyvinyl chloride (pvc), acrylic resins, polyester resins and polystyrene. Polyethylene, stabilized with carbon black, has been used indoors for above-ground cold water service pipes. At normal indoor temperatures these are tough with a high impact resistance. They do not corrode and present-day compression jointing and welding techniques have overcome earlier fixing difficulties. They should not be used for hot water services for even high density polyethylene embrittles and deteriorates if its temperature regularly exceeds 115 deg. F.—a property which precludes its continued use if exposed directly to the tropical sun, especially in desert and marine atmospheres. Polyethylene can be usefully employed in sheet form as a vapour barrier, as a temporary protective covering to both buildings and materials, and as a curing membrane for concrete. It is available reinforced with glass fibre. It should be noted that polyethylene is susceptible to slight termite nibbling which limits its possible uses below ground. It is highly resistant to fungal growth which, when it occurs, is generally confined to extraneous surface matter.

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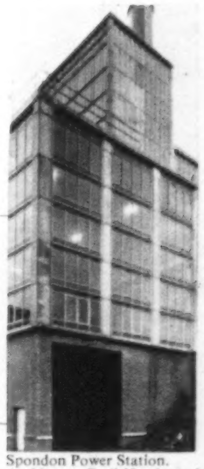

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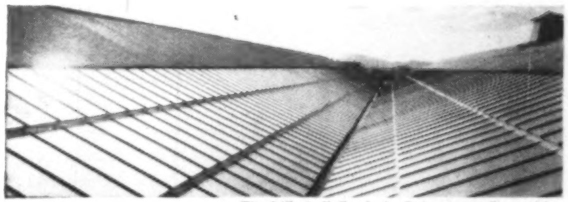

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P8

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So far, the principal building use for polyvinyl chloride (pvc) has been as a tough, flexible floor covering in sheet or tile form. For interior use there are no special tropical problems. Pvc in a wide range of colours has been recently introduced for rainwater goods and as a covering to metal and wooden window frames. There is no published experience yet of this use in the Tropics but there are good technical reasons for believing that black, grey and white colours will weather best. The rainwater goods are light, easy to handle, and do not corrode. Adequate provision must be made for their high thermal expansion which is some ten times that of steel. On metal window frames, too, differential thermal expansion of the pvc and of the metal may pose problems. Termites are known to nibble pvc and, with wooden window frames, there is a possibility of attack on the pvc to reach the timber with the subsequent destruction of the frame. This possible termite attack makes the use of pvc water and gas pipe for use underground unlikely but above ground and indoors it should be satisfactory. Pvc may also be used for waterstops in expansion joints.

Acrylic resins and polyester resins reinforced with glass fibre have been used as translucent corrugated roof sheets for daylighting. Under tropical exposure, they will both suffer some loss in light transmission and can discolour. Acrylic sheets are essentially durable and give good service. Less is known of the durability of polyester resin. With many of the reinforced polyester resins at present available the glass fibres will slowly become exposed and the dirt then collected will encourage mould growth.

Expanded polystyrene is a good insulator, essentially free from attack by insects and mould but has a maximum safe working temperature of around 140 deg. F. This limits its use in the Tropics—it could be unwise, for example, to place it immediately underneath a black bituminous roofing felt.

Plastics, particularly urea-formaldehyde, are also used in the manufacture of resin-bonded wood particle board. The properties of particle board depend greatly upon the type of wood chip used. Random wood waste is undesirable. Forest thinnings are mainly employed, preferably of coniferous timber whose naturally high resin content prevents undue absorption of the expensive plastics resin. The chips are bonded under pressure and heat and the boards so formed can be used internally for flooring, ceilings and partitions, but are not suitable for prolonged external use.

Phenol-formaldehyde is weather-resistant and is used in the production of opaque corrugated paper-resin laminates for roofing. Save for loss of original gloss such roof sheets are durable to tropical exposure. Hollow rigid phenol-formaldehyde bonded panels have been used successfully as internal partitions. Melamine formaldehyde paper laminates have been used for facing hardboard, particle board, and phenol formaldehyde paper laminates and give satisfactory service indoors.

Plastics are also used in the preparation of modern paints—notably the emulsion and alkyd resin paints. Though there are others, the emulsion paints mainly used today are based on polyvinyl-acetate (pva) emulsified in water which, being a colourless medium, allows clean pastel shades to be produced. Pva emulsion paints are primarily decorative—not protective—and the best results are obtained on concrete, brick, stone and plaster. These surfaces can be painted when slightly damp for the pva paint film is porous and allows moisture to breathe through it. Application is easy by brush or roller and a good finish is obtained showing few joints; drying is rapid. Flaking of pva paint is rare, adhesion in multiple coats is good, and fungal resistance is high. Alkyd resin paints are both decorative and protective and can be obtained in many brilliant colours. They dry rapidly to give a tough, elastic film of considerable durability. Early difficulties of application have now been overcome. They are reasonably resistant to mould growth but less so when weathering has roughened the surface.

Pitch-fibre sewage pipes consisting primarily of cellulosic fibres impregnated under vacuum with heated coal-tar pitch are also new to the Tropics. They are light (5 lb. a foot run for a 6-in. diameter pipe), tough and resilient, and resistant to soil sulphates, to attack by sewage, and to fungal decay but not to organic pitch solvents and to continuous hot water. Pipes are of smooth bore with tapered ends and the few joints needed are easily made by driven-on sleeve couplings. These eliminate the need for jointing compounds and so the possibility of obstruction in the pipes and the later entry of tree roots. They can be safely used underground. They should not be stored in direct sunlight for the high surface temperature then reached could seriously reduce their otherwise satisfactory resistance to flattening.

Brief mention may be made in conclusion of aluminium sheets. They are light and strong, and alloy NS-3 (BS 1470 : 1955), which is chiefly used, has considerable resistance to corrosion even near the coast. Corrosion can occur, however, through direct contact with dissimilar materials—particularly with copper, lead, concrete, lime and some woods—and through crevice conditions. This is especially likely in wet regions and special protective measures are called for. Fixing accessories should be of aluminium, or galvanized or stainless steel, and crevices should be packed with a suitable barium chromate jointing compound. To avoid the discomfort from 'glare' from the surface of new sheets these can now be obtained suitably treated. Aluminium may be anodized to thicken artificially the weather-resistant oxide film which forms naturally upon exposure. The anodized layer can be dyed and coloured sheets are available. The main outlet so far, however, has been for window frames and curtain walling.

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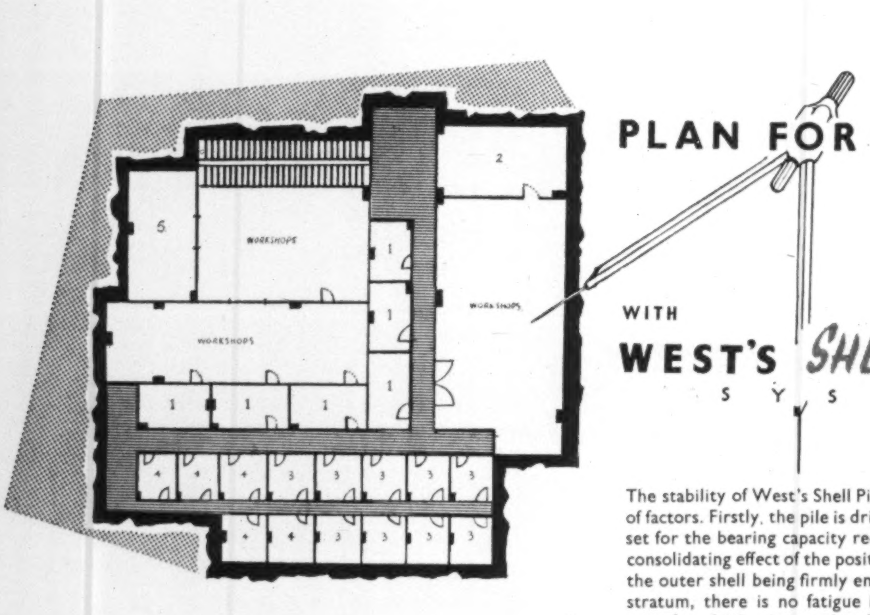

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Plastics, particularly urea-formaldehyde, are also used in the manufacture of resin-bonded wood particle board. The properties of particle board depend greatly upon the type of wood chip used. Random wood waste is undesirable. Forest thinnings are mainly employed, preferably of coniferous timber whose naturally high resin content prevents undue absorption of the expensive plastics resin. The chips are bonded under pressure and heat and the boards so formed can be used internally for flooring, ceilings and partitions, but are not suitable for prolonged external use.

Phenol-formaldehyde is weather-resistant and is used in the production of opaque corrugated paper-resin laminates for roofing. Save for loss of original gloss such roof sheets are durable to tropical exposure. Hollow rigid phenol-formaldehyde bonded panels have been used successfully as internal partitions. Melamine formaldehyde paper laminates have been used for facing hardboard, particle board, and phenol formaldehyde paper laminates and give satisfactory service indoors.

Plastics are also used in the preparation of modern paints—notably the emulsion and alkyd resin paints. Though there are others, the emulsion paints mainly used today are based on polyvinyl-acetate (pva) emulsified in water which, being a colourless medium, allows clean pastel shades to be produced. Pva emulsion paints are primarily decorative—not protective—and the best results are obtained on concrete, brick, stone and plaster. These surfaces can be painted when slightly damp for the pva paint film is porous and allows moisture to breathe through it. Application is easy by brush or roller and a good finish is obtained showing few joints; drying is rapid. Flaking of pva paint is rare, adhesion in multiple coats is good, and fungal resistance is high. Alkyd resin paints are both decorative and protective and can be obtained in many brilliant colours. They dry rapidly to give a tough, elastic film of considerable durability. Early difficulties of application have now been overcome. They are reasonably resistant to mould growth but less so when weathering has roughened the surface.

Pitch-fibre sewage pipes consisting primarily of cellulosic fibres impregnated under vacuum with heated coal-tar pitch are also new to the Tropics. They are light (5 lb. a foot run for a 6-in. diameter pipe), tough and resilient, and resistant to soil sulphates, to attack by sewage, and to fungal decay but not to organic pitch solvents and to continuous hot water. Pipes are of smooth bore with tapered ends and the few joints needed are easily made by driven-on sleeve couplings. These eliminate the need for jointing compounds and so the possibility of obstruction in the pipes and the later entry of tree roots. They can be safely used underground. They should not be stored in direct sunlight for the high surface temperature then reached could seriously reduce their otherwise satisfactory resistance to flattening.

Brief mention may be made in conclusion of aluminium sheets. They are light and strong, and alloy NS-3 (BS 1470 : 1955), which is chiefly used, has considerable resistance to corrosion even near the coast. Corrosion can occur, however, through direct contact with dissimilar materials—particularly with copper, lead, concrete, lime and some woods—and through crevice conditions. This is especially likely in wet regions and special protective measures are called for. Fixing accessories should be of aluminium, or galvanized or stainless steel, and crevices should be packed with a suitable barium chromate jointing compound. To avoid the discomfort from 'glare' from the surface of new sheets these can now be obtained suitably treated. Aluminium may be anodized to thicken artificially the weather-resistant oxide film which forms naturally upon exposure. The anodized layer can be dyed and coloured sheets are available. The main outlet so far, however, has been for window frames and curtain walling.

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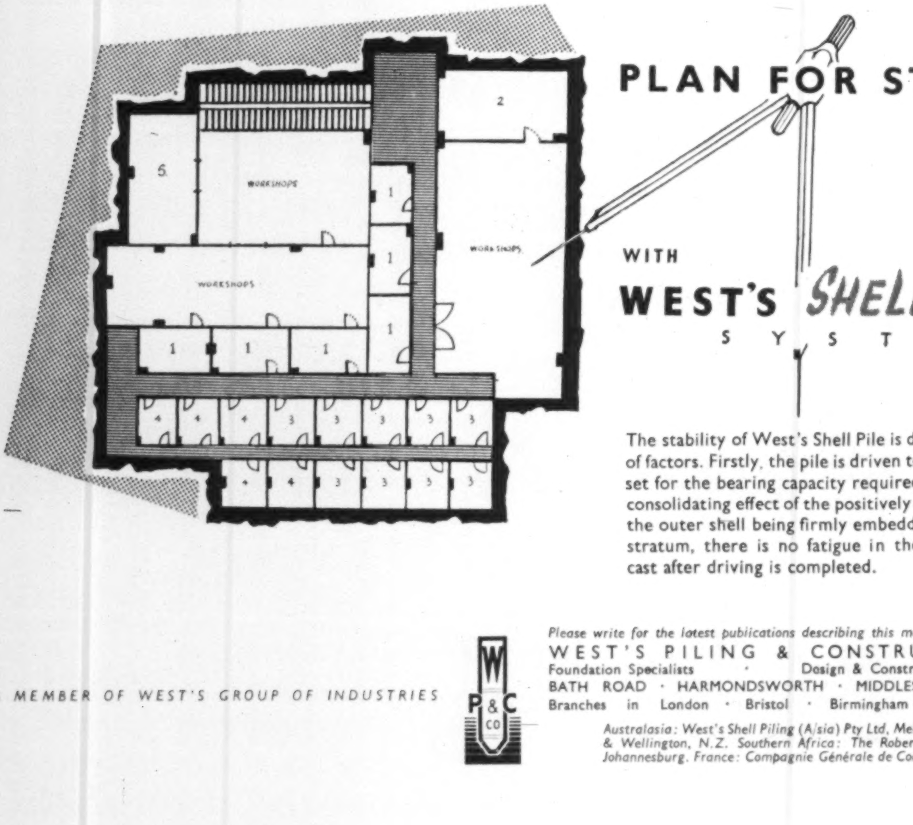

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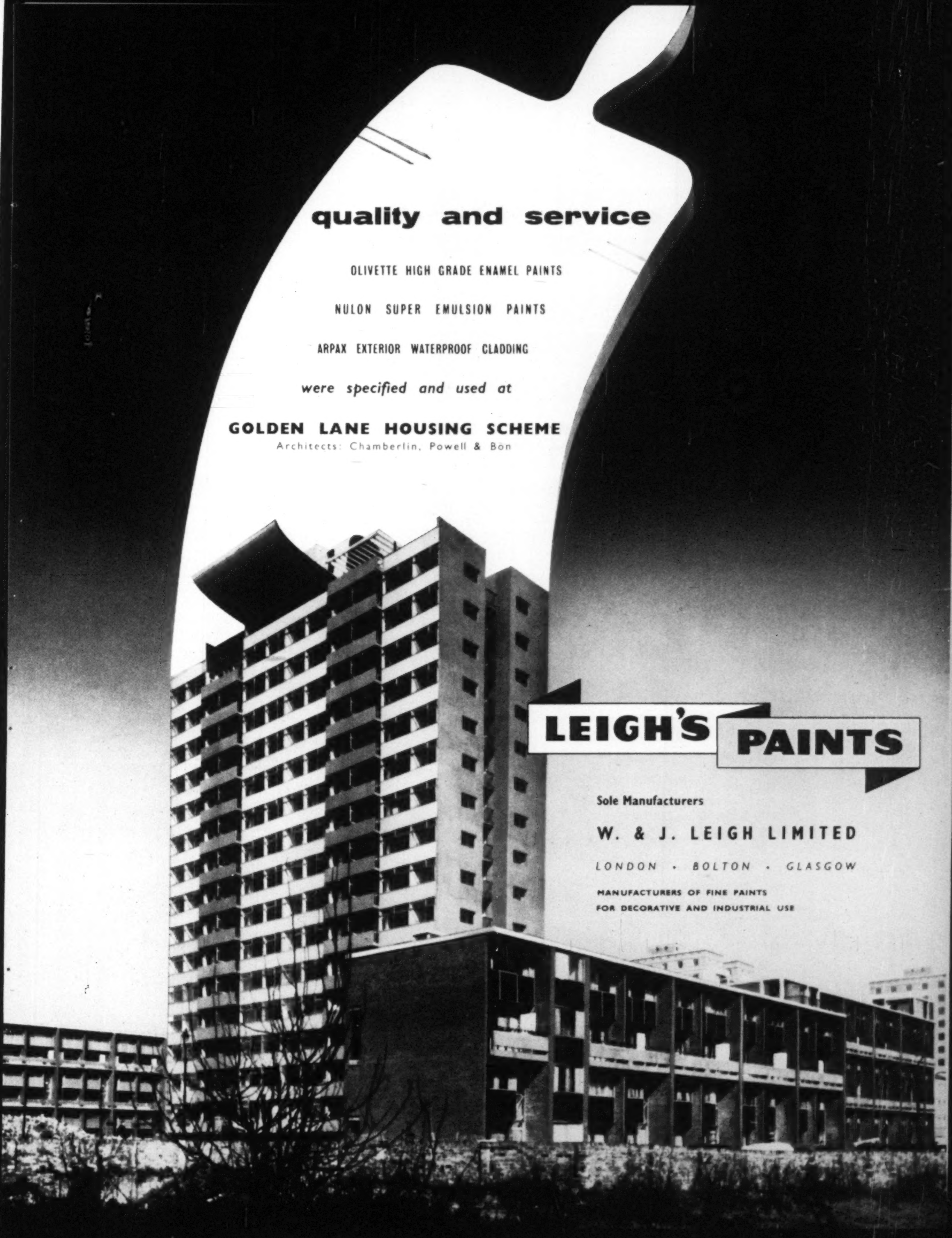

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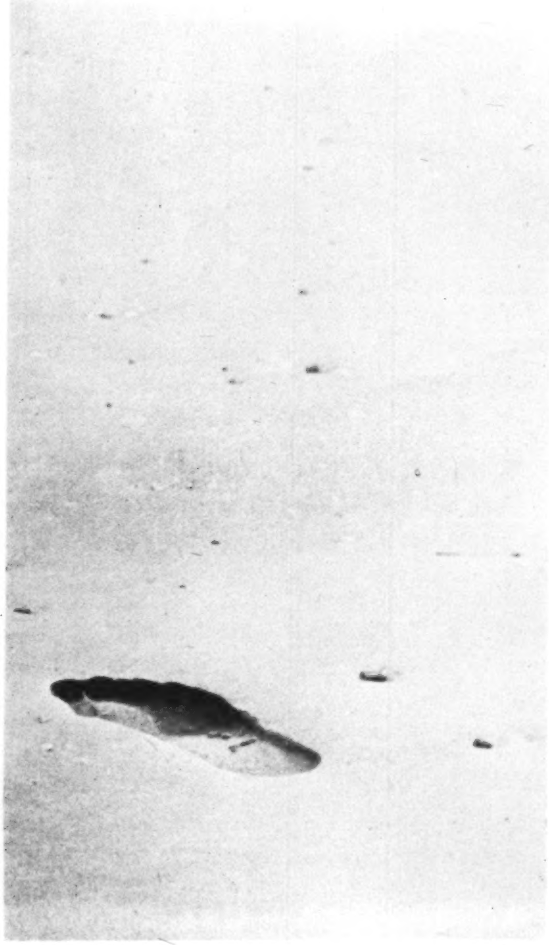

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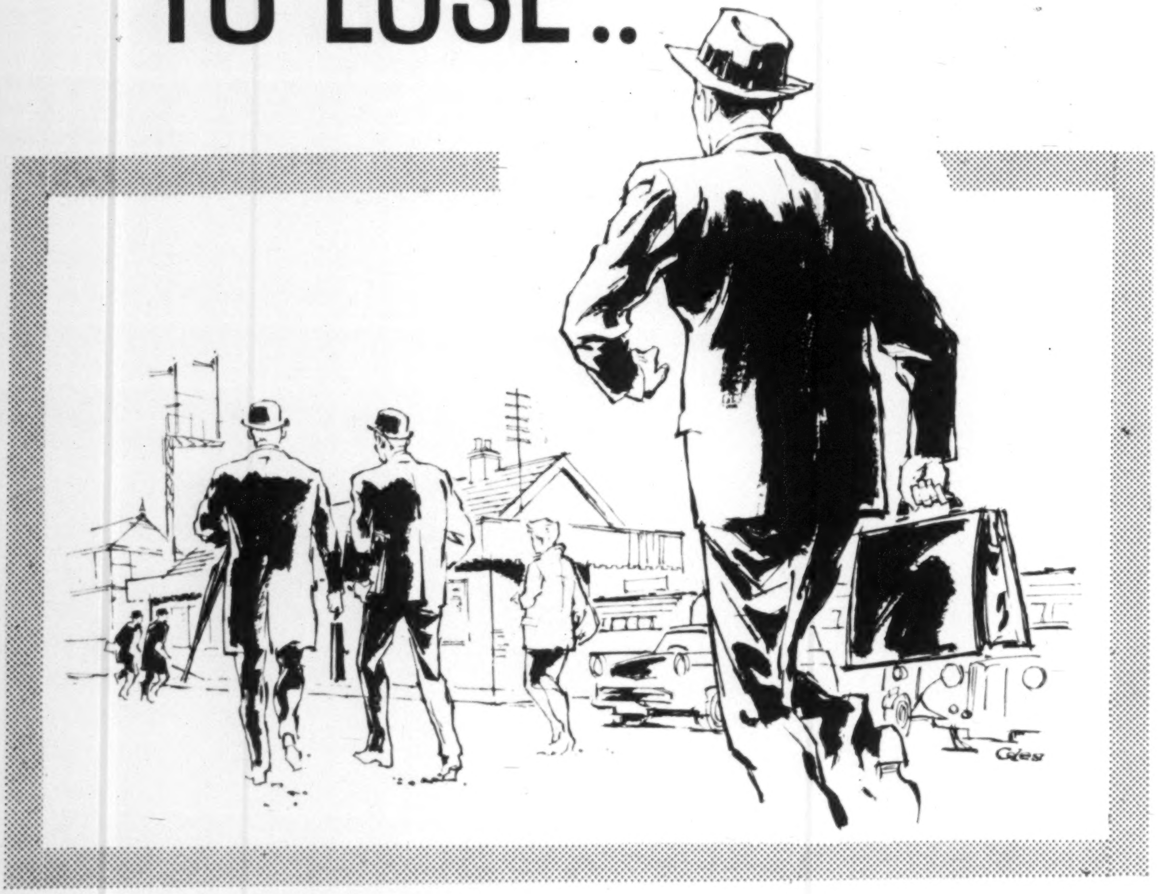

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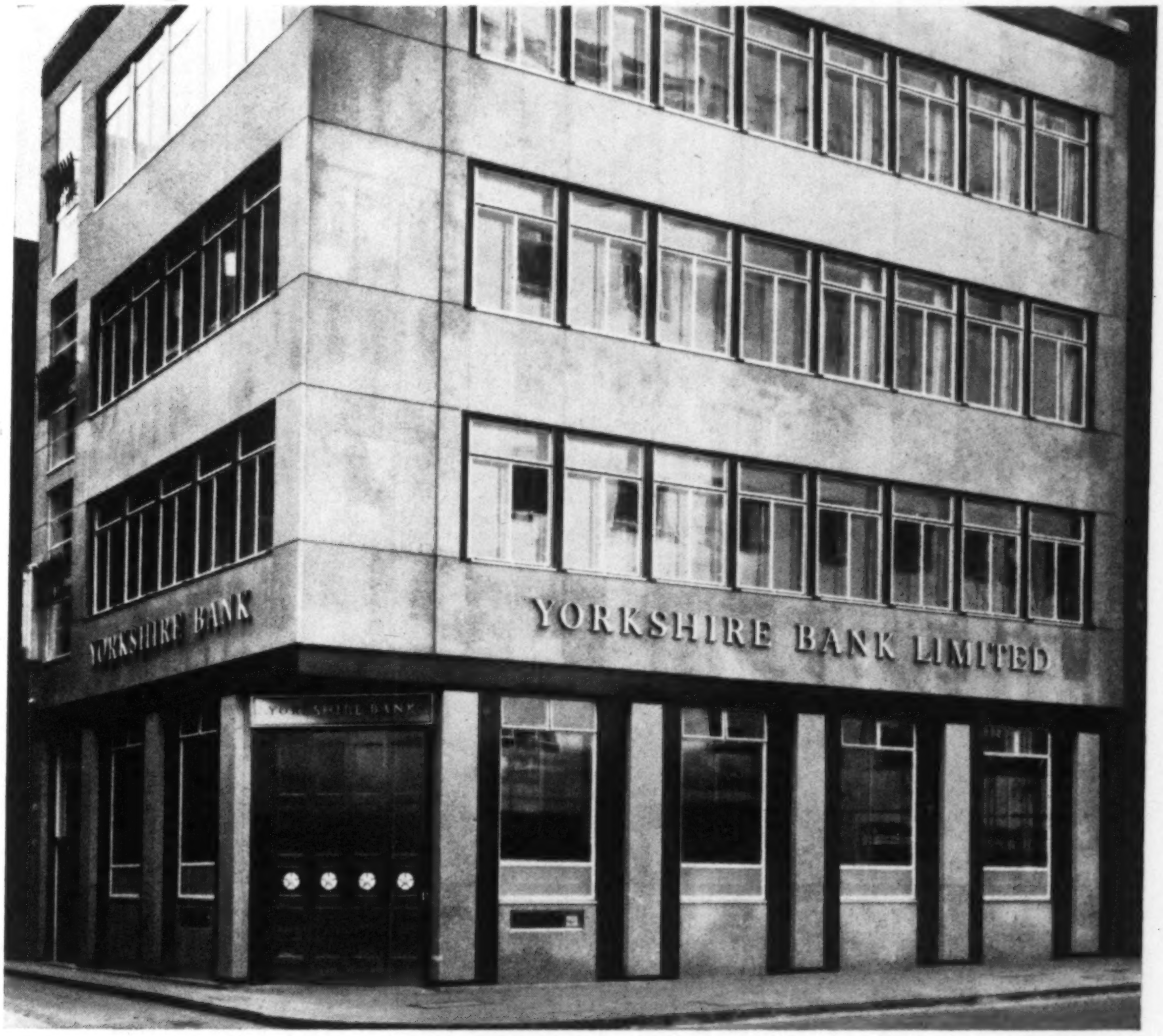

When the Directors of the Yorkshire Bank wanted a new head office building on a site adjoining London's ancient Bow Church in Cheapside, they chose Wates for the job because Wates build well. Result was this dignified, modern block, comprising basement strongrooms, ground floor banking hall and three floors of offices. In carrying out the plans of the architects, Trehearne and Norman Preston & Partners, Wates gave a first-class account of themselves. They invariably do. You can bank on it !

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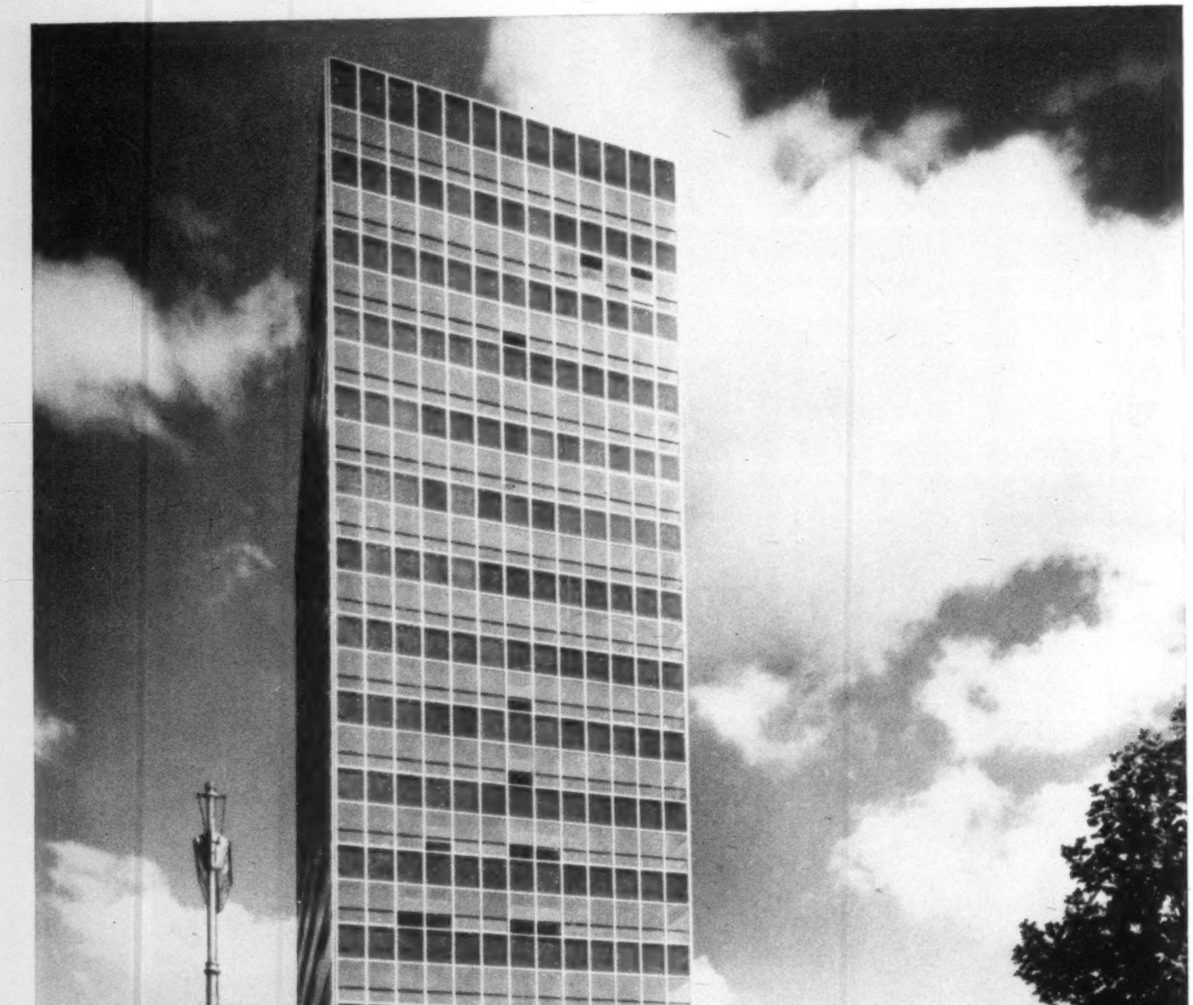
CASTROL HOUSE
Curtain Walling is quick
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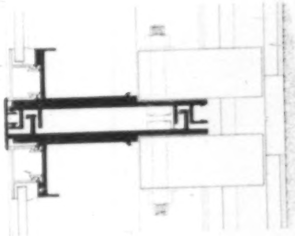
FACTS

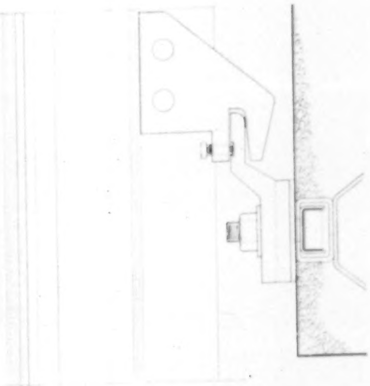
A new type of Wallspan makes its debut on the tower of Castrol House—a prefabricated Wallspan designed in collaboration with the architect that goes up more quickly than any curtain walling system yet devised. Williams & Williams developed it specially to fit in with a tight building schedule—18 months from start to finish.

The main feature of prefabricated Wallspan is that its mullion is split vertically in half. This allows it to be supplied in complete prefabricated panels 2 floors high, with the double-hung windows already in place. Each panel is simply hung on to its fixing spigots, plumbed, then interlocked with its neighbour. The walls of the tower block were erected at the rate of 2 floors a week: the interior trades were able to move in and get on with their job fully protected while the floors above were still being clad.

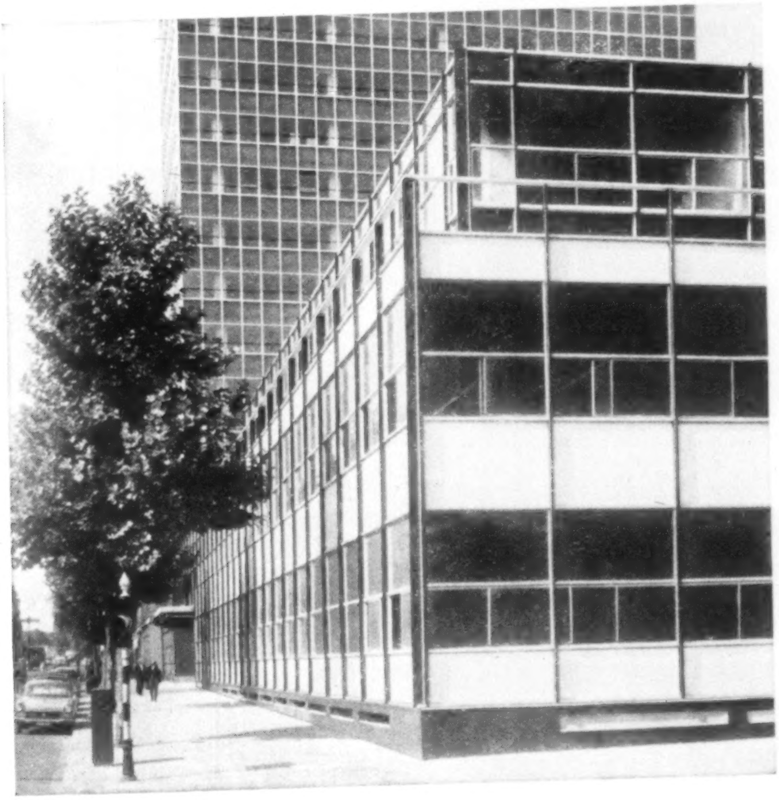
The vertical section shows how the prefabricated Wallspan is literally *hung* on to the frame. It is curtain walling in the truest sense, and although designed in the first place specifically for Castrol House, the system is now generally available—a classic example of co-operation between the architect and the curtain walling specialists.



Horizontal section at infill level. Each half mullion forms the edge of a prefabricated panel. When the two panels are brought together, the joint is sealed with Thiokol mastic and an aluminium capping is then clipped on to seal the joint finally.



Vertical section showing fixing detail. As the floor slab is cast, bolts are built in ready to receive the fixing spigots. These are adjustable vertically and horizontally to allow for slight inaccuracies. Hooks on the Wallspan panels engage over the spigots and are kept firmly in place by compression bolts.



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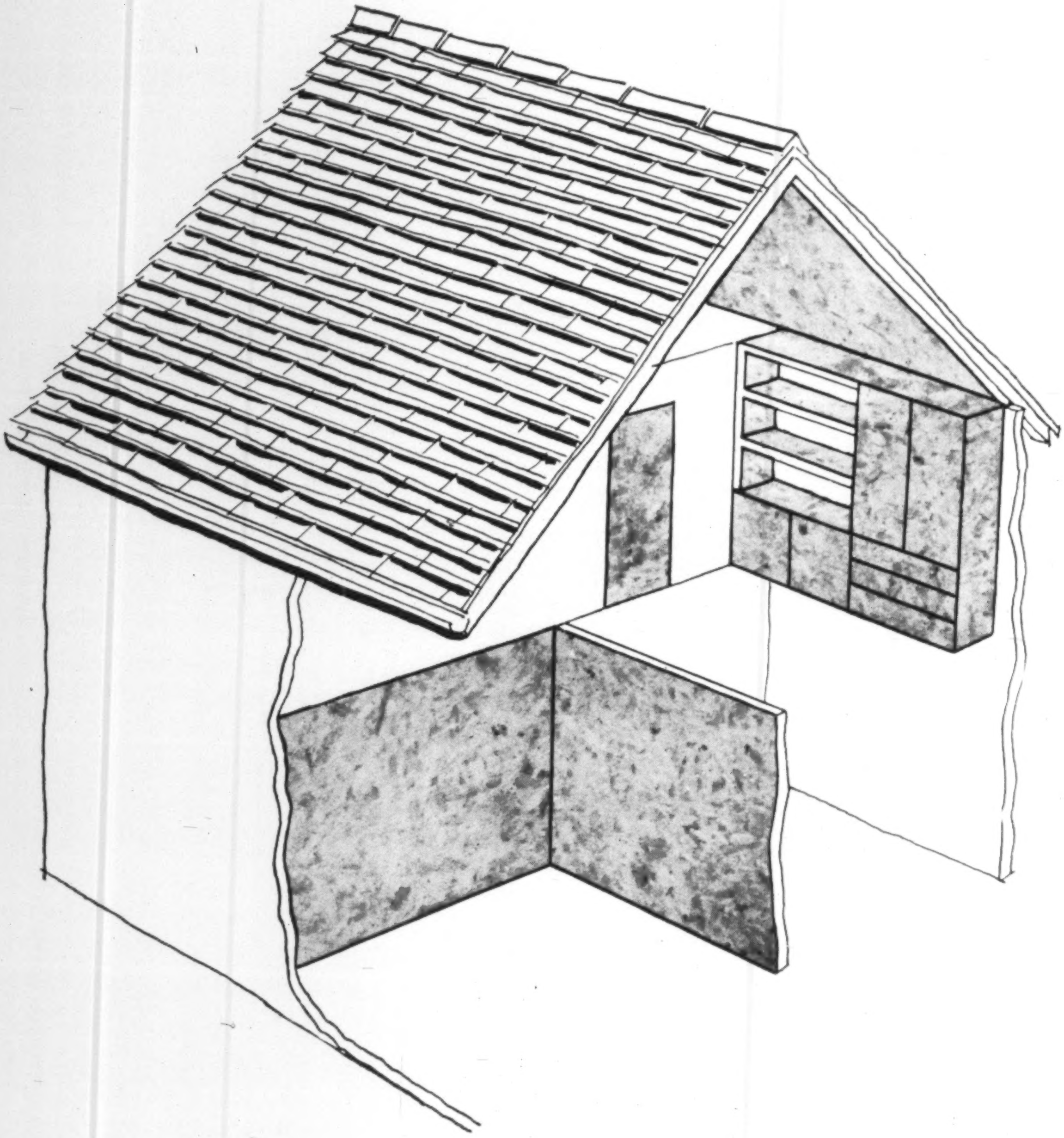

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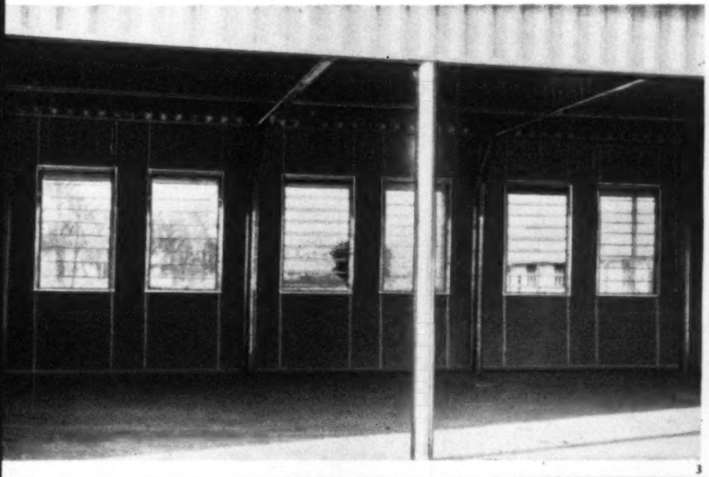

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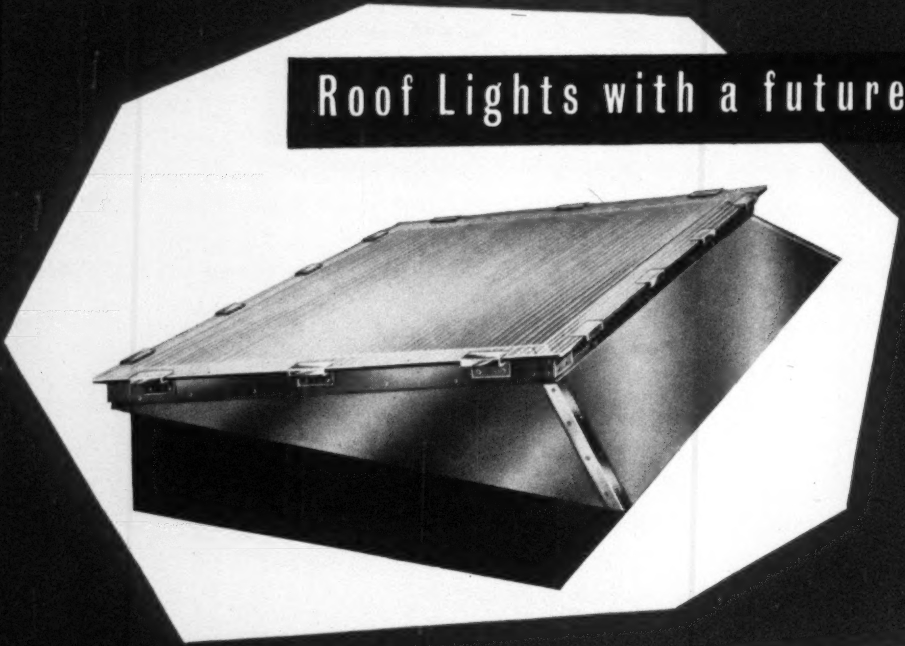

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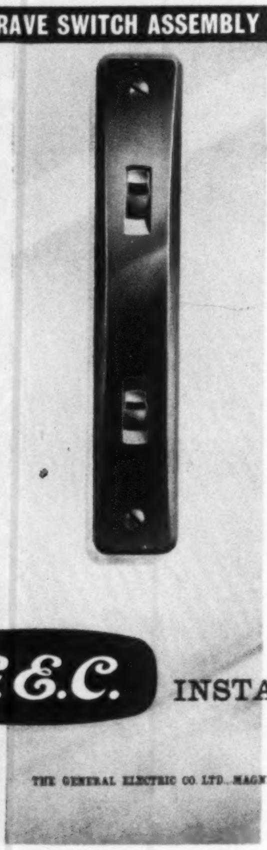

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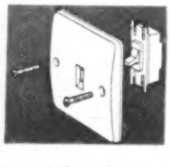

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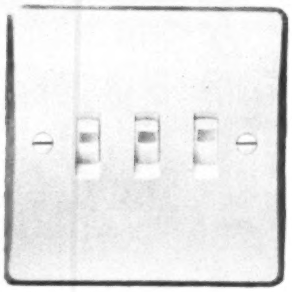

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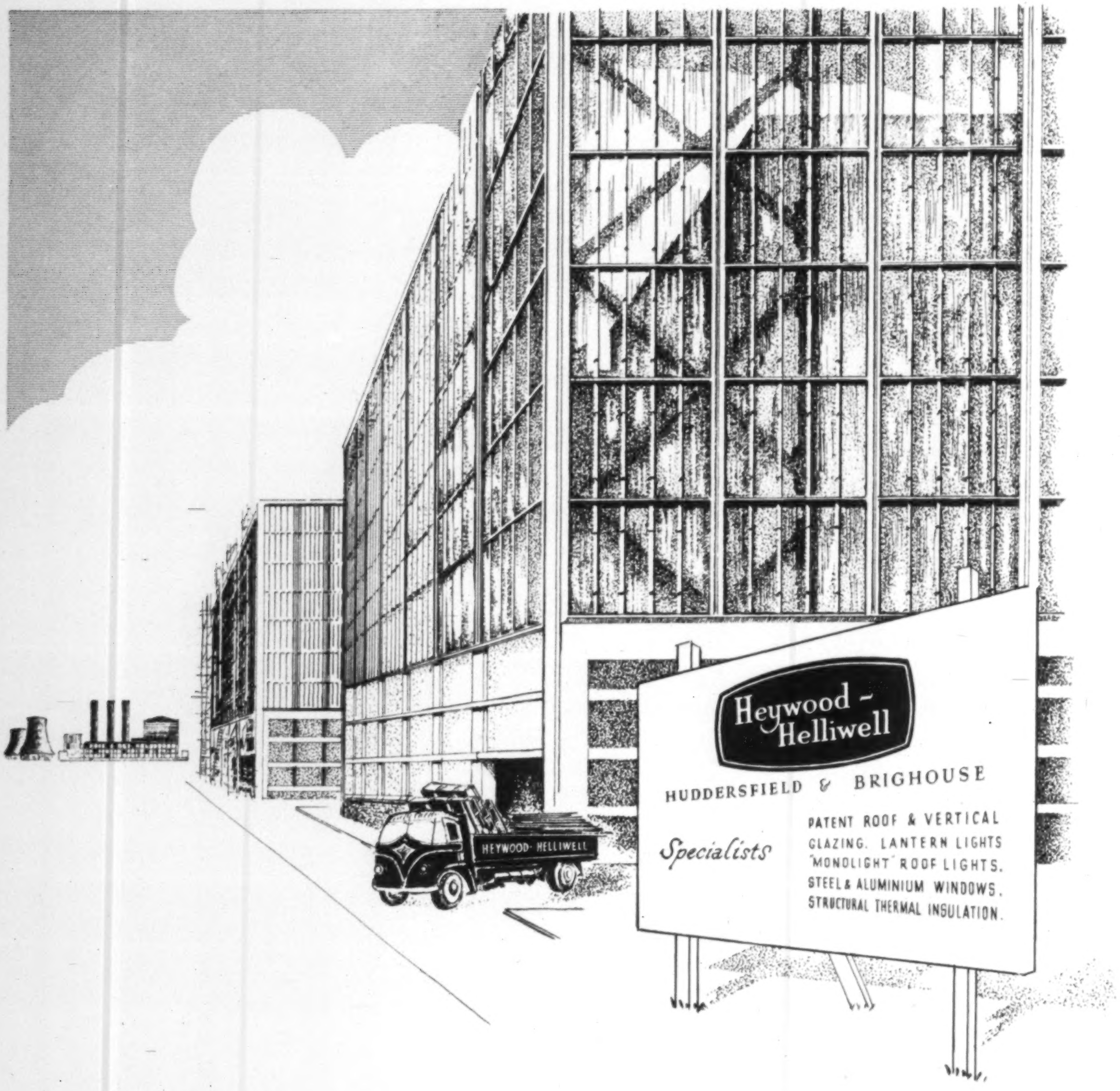
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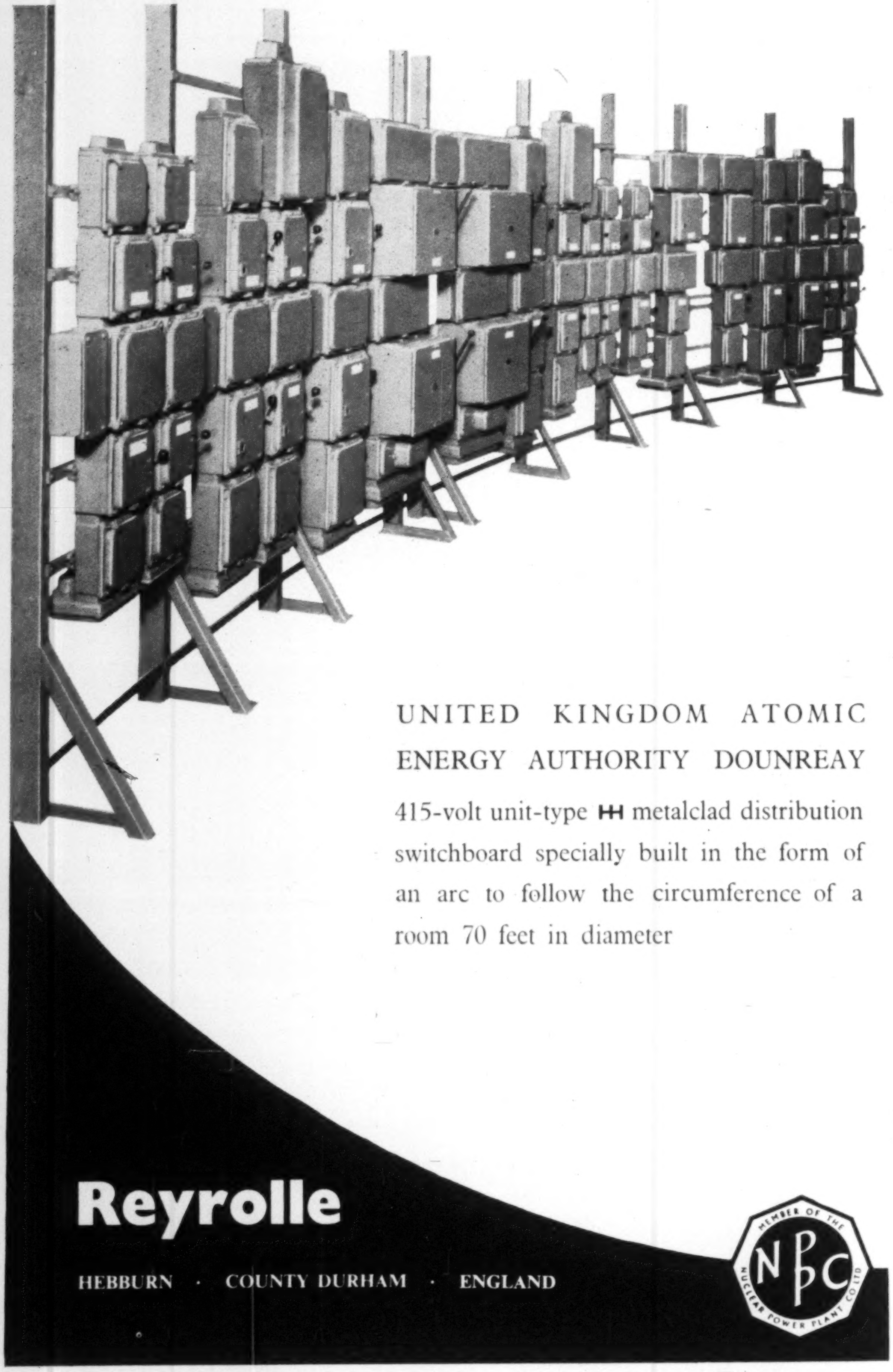

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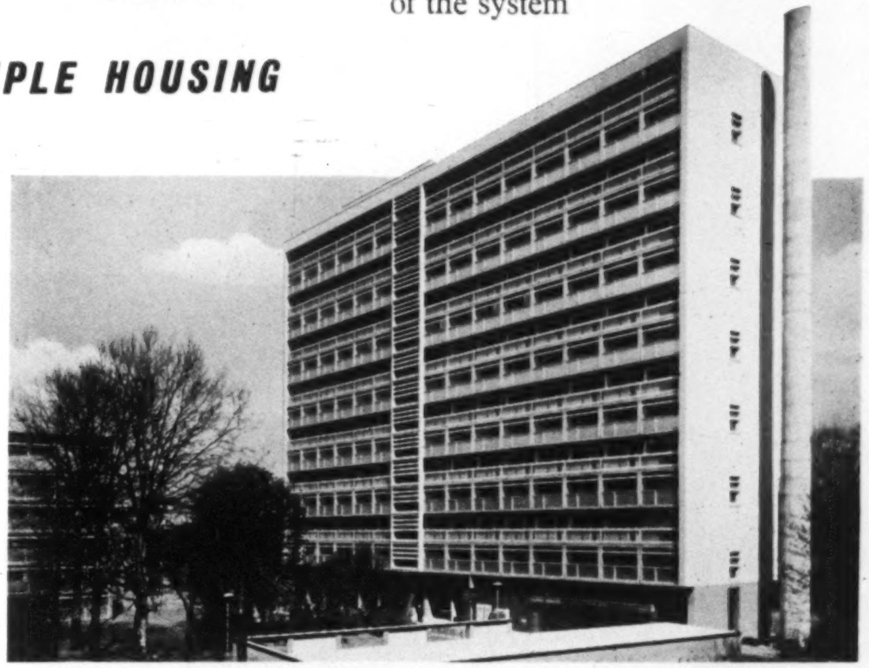

15-STOREY MAISONETTES, SCEAUX GARDENS, CAMBERWELL (Photograph by Sam Lambert)
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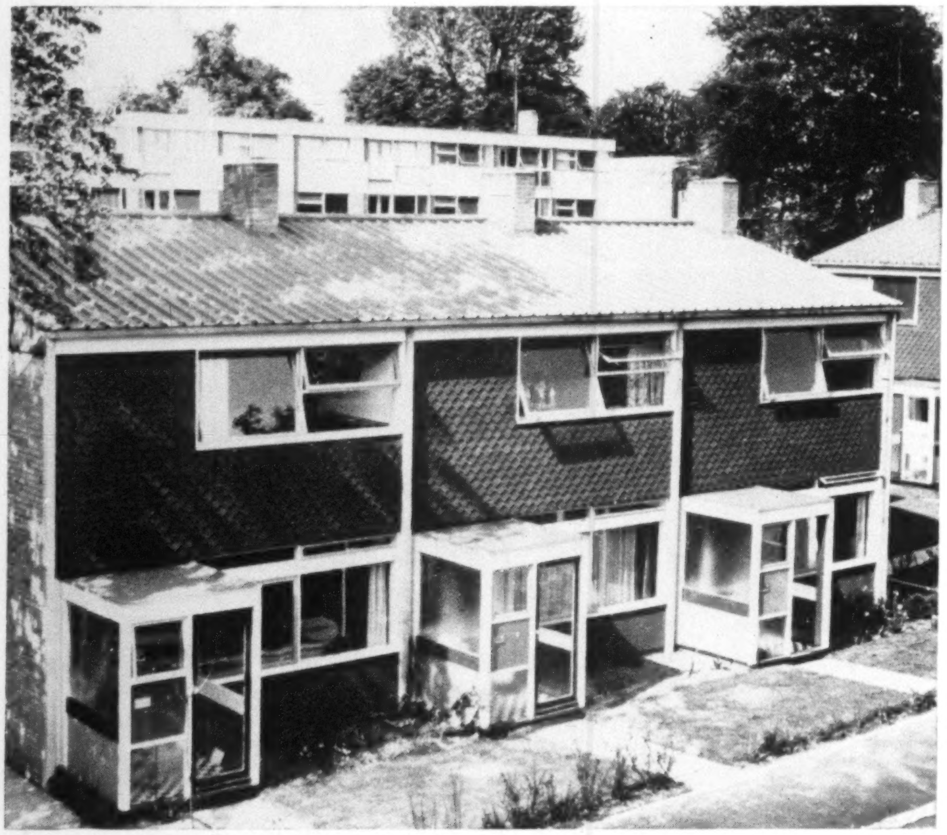

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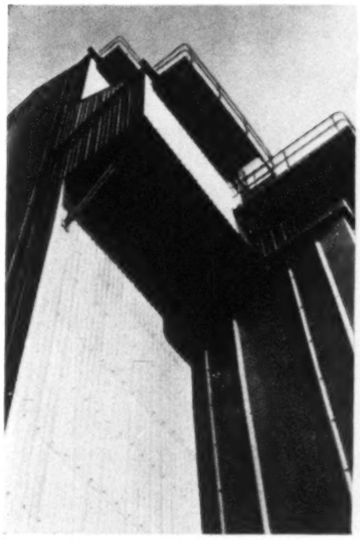

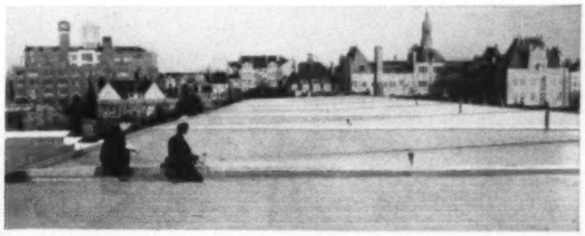

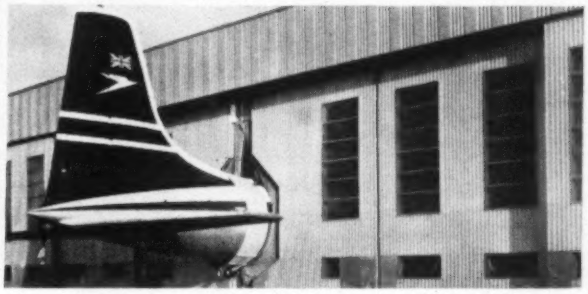

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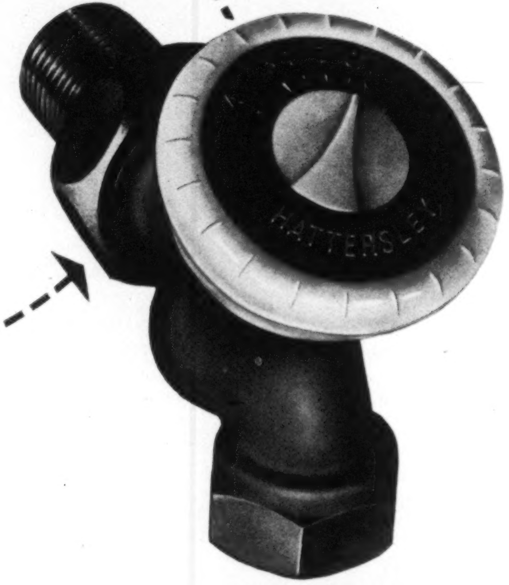

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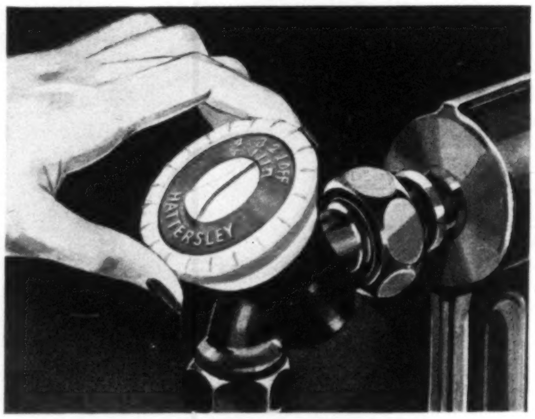

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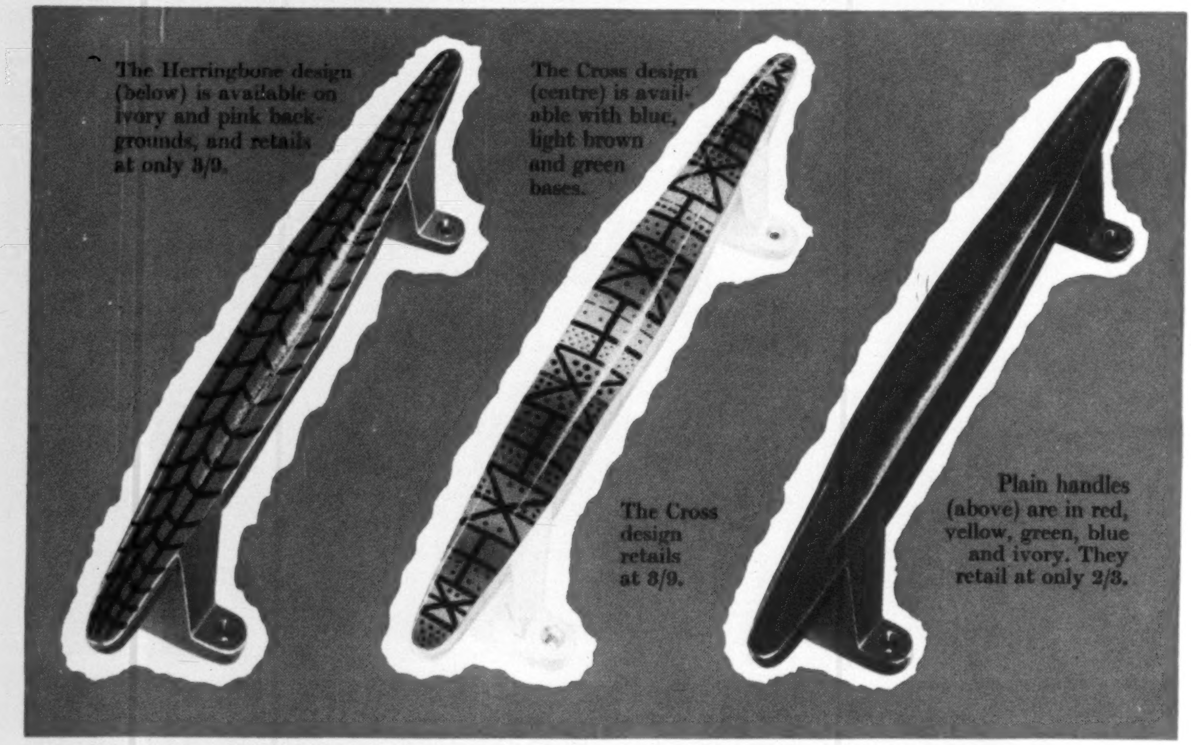

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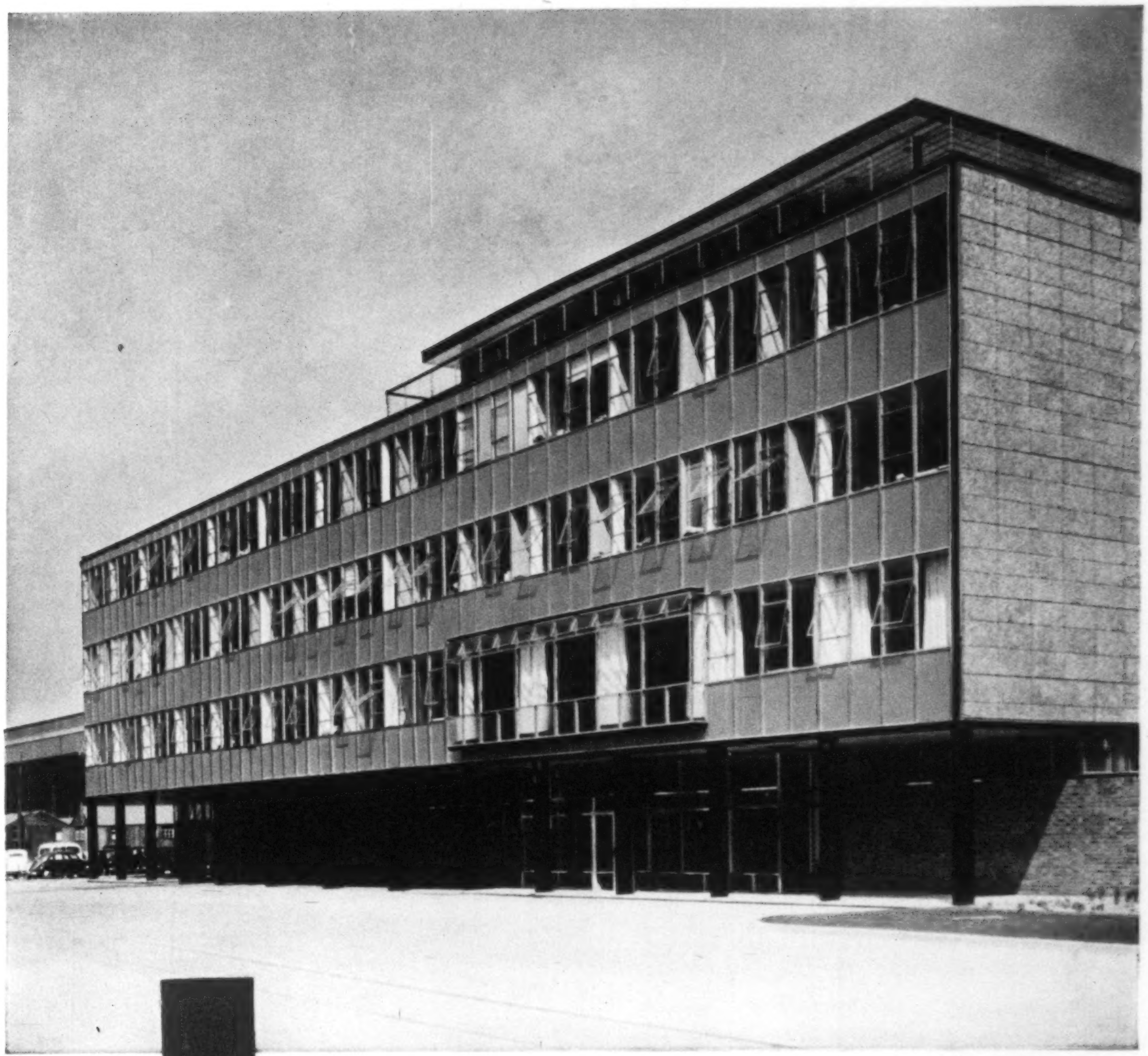

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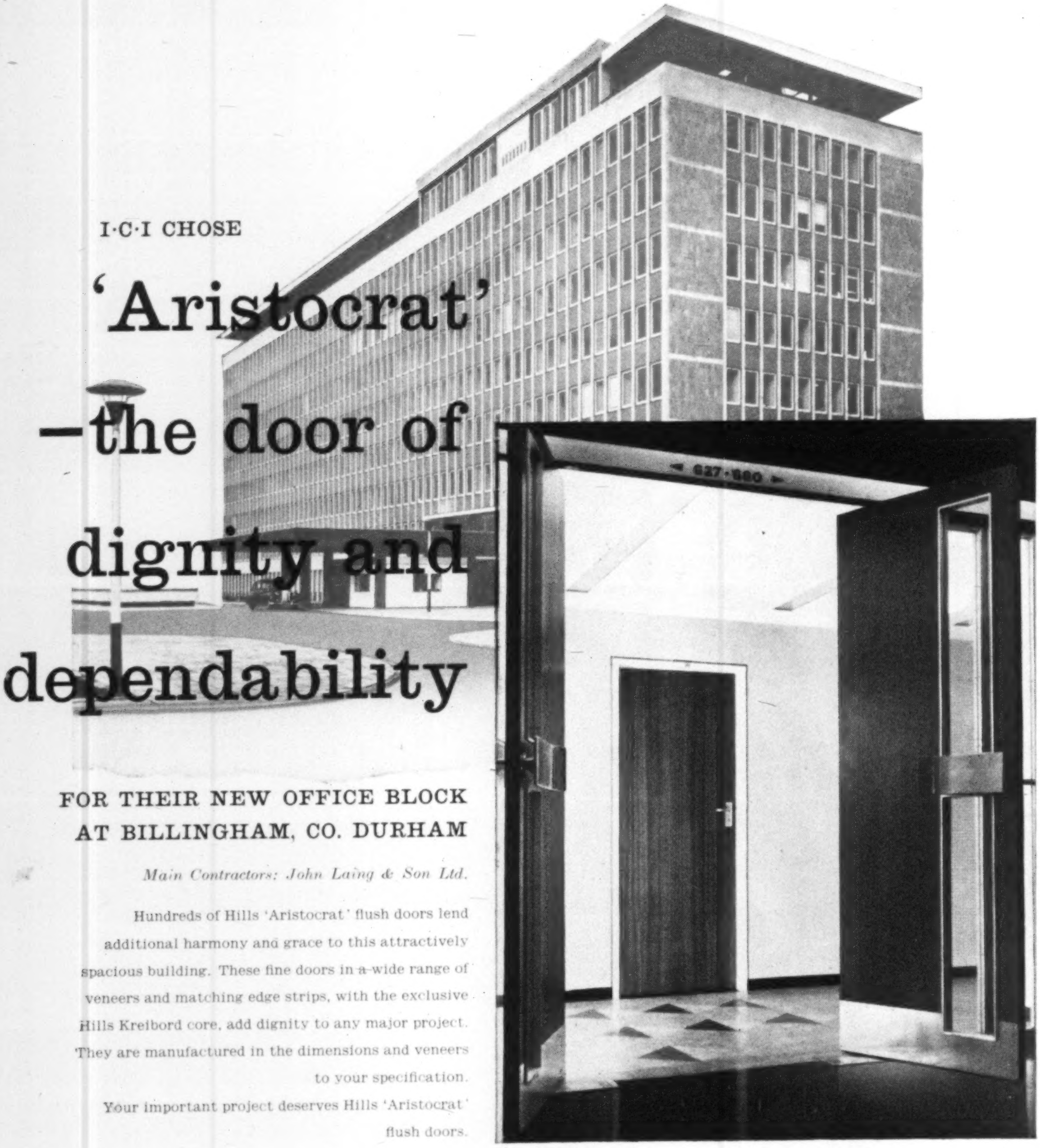

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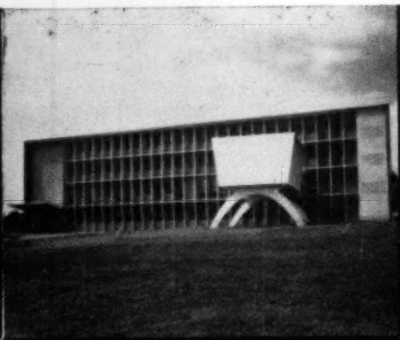

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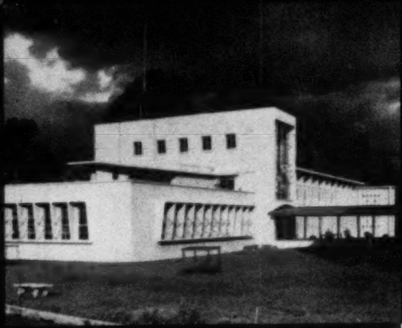

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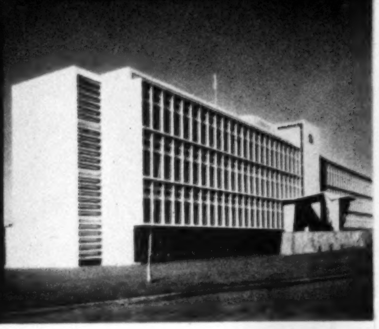

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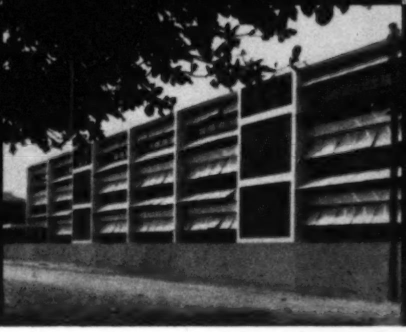

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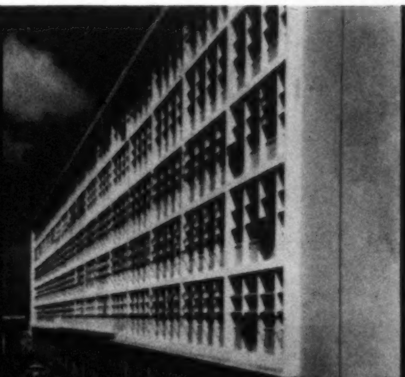

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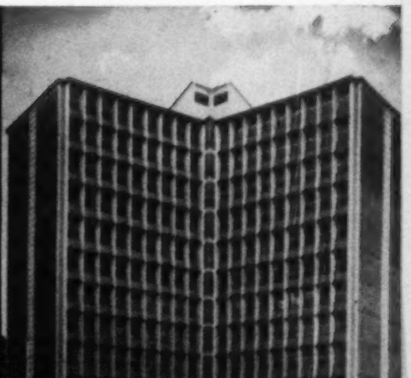

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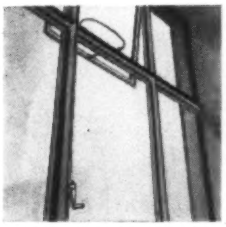

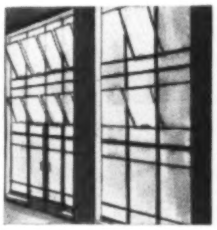

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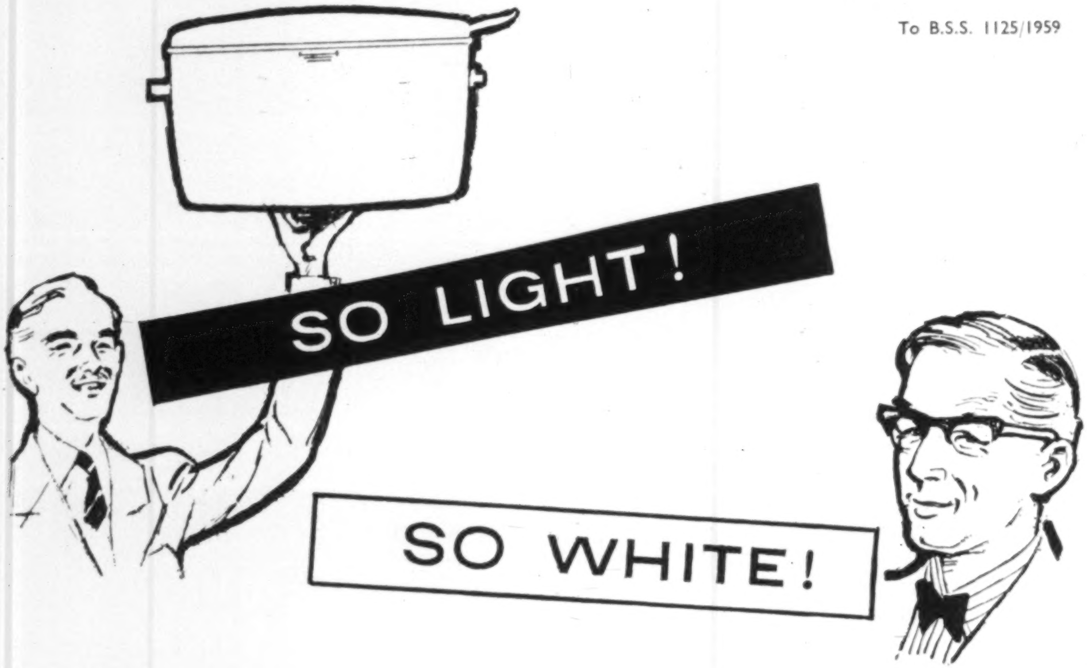
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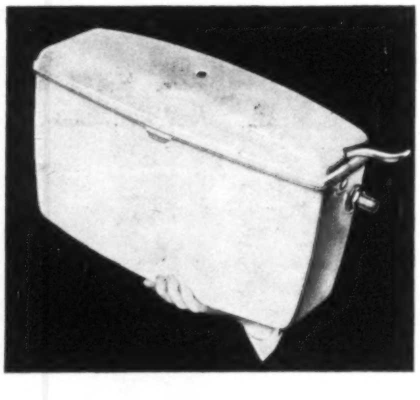

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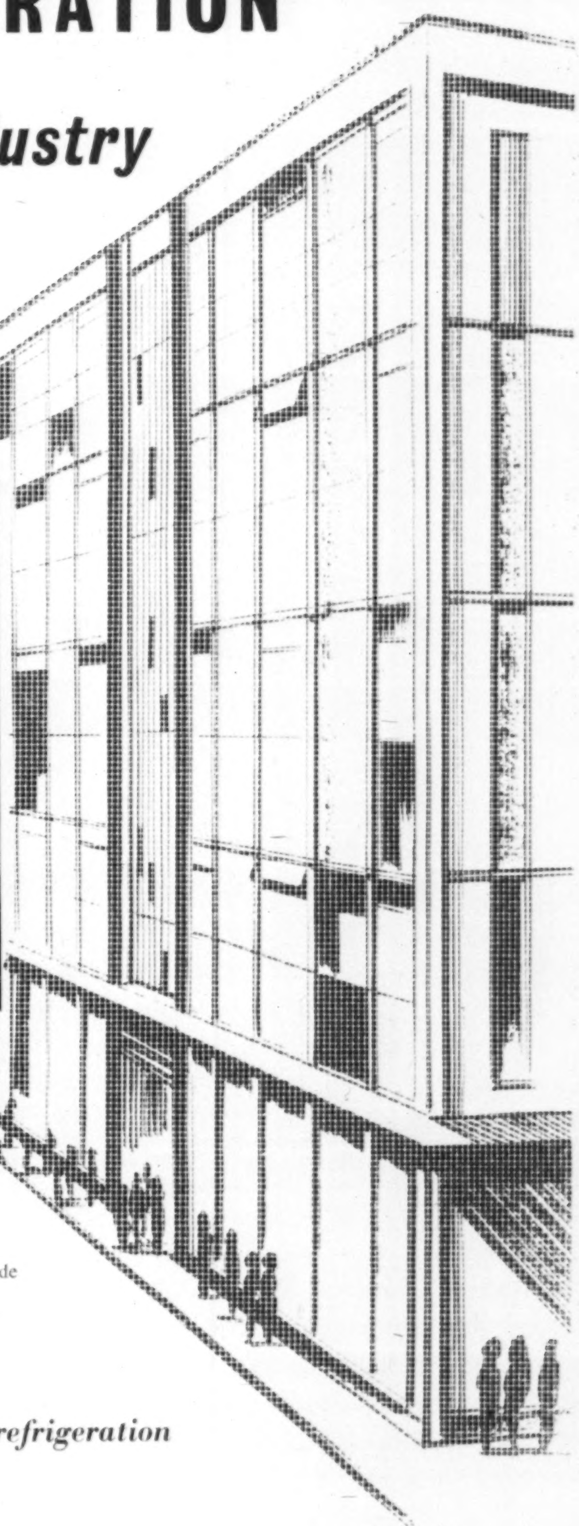

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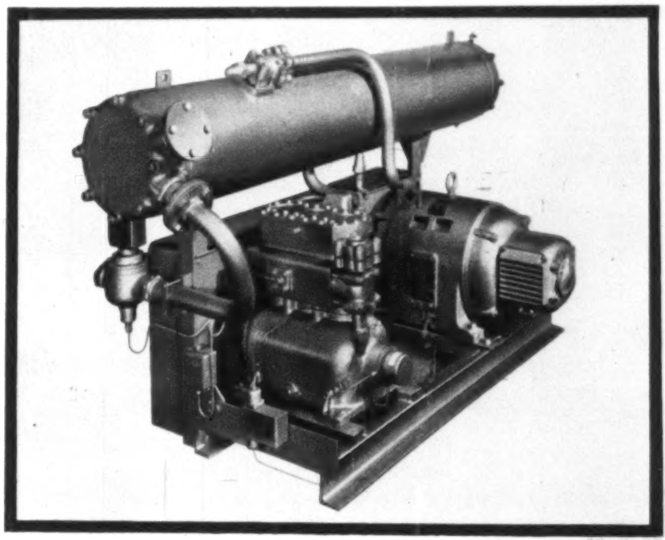

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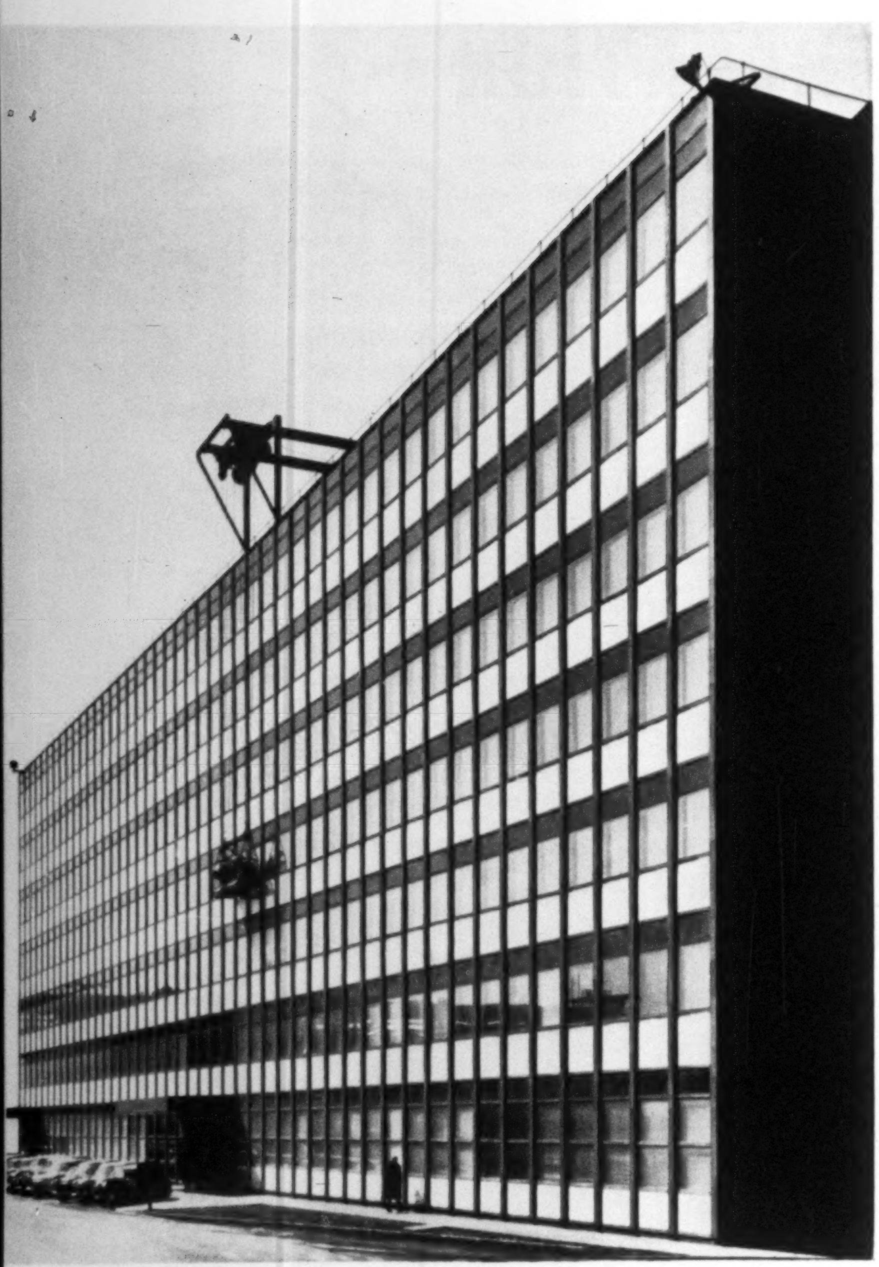

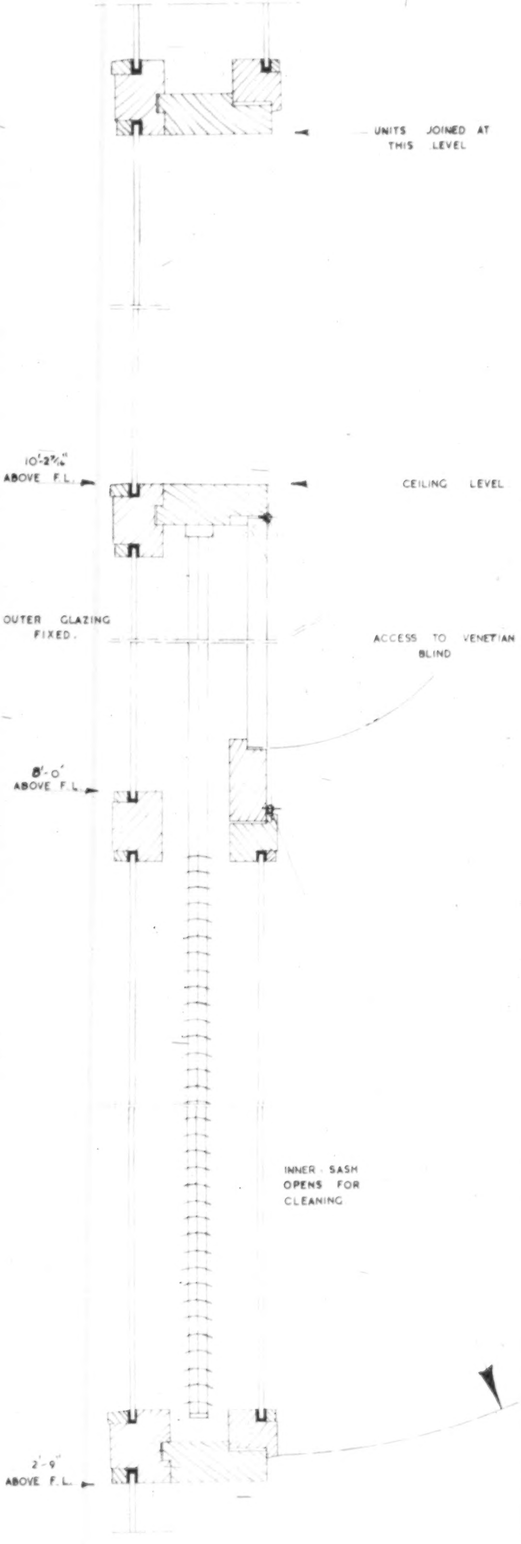
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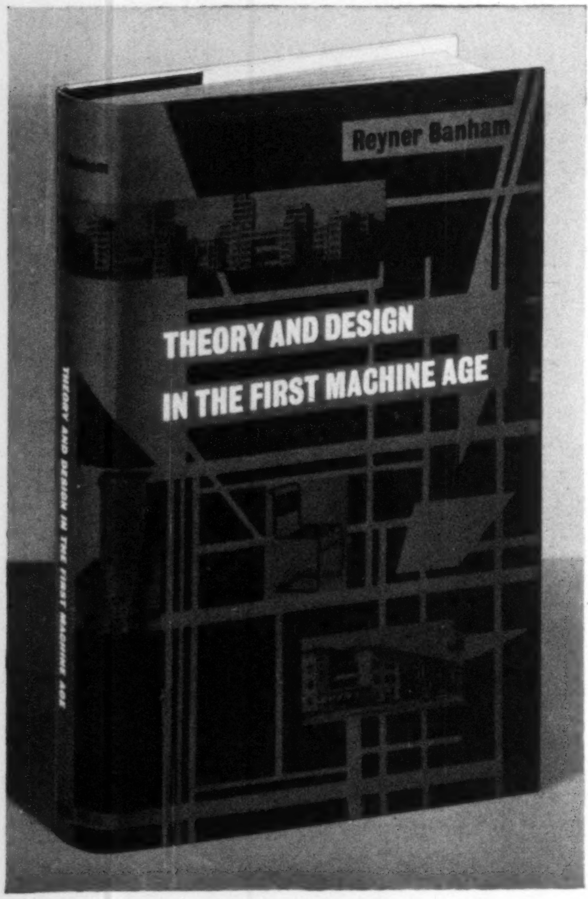

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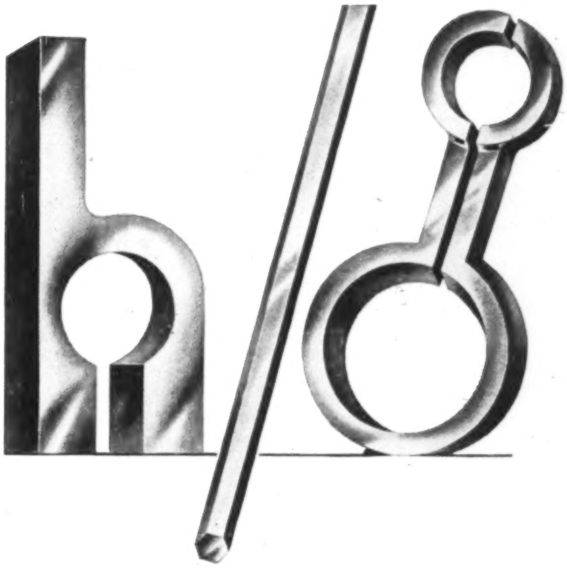

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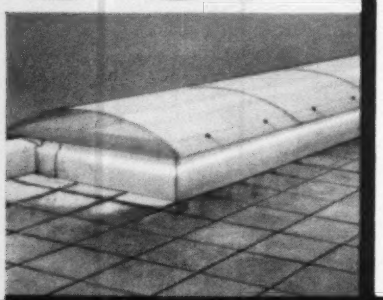

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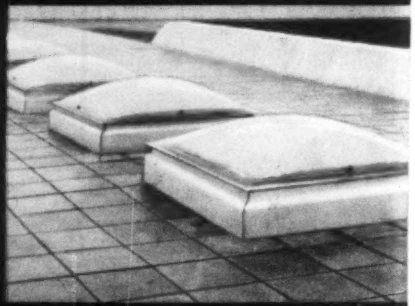

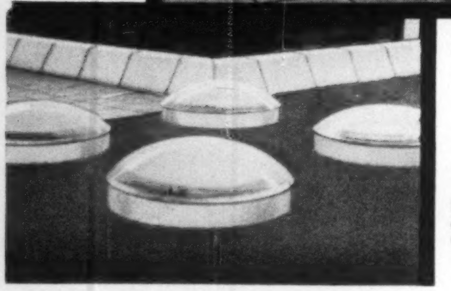

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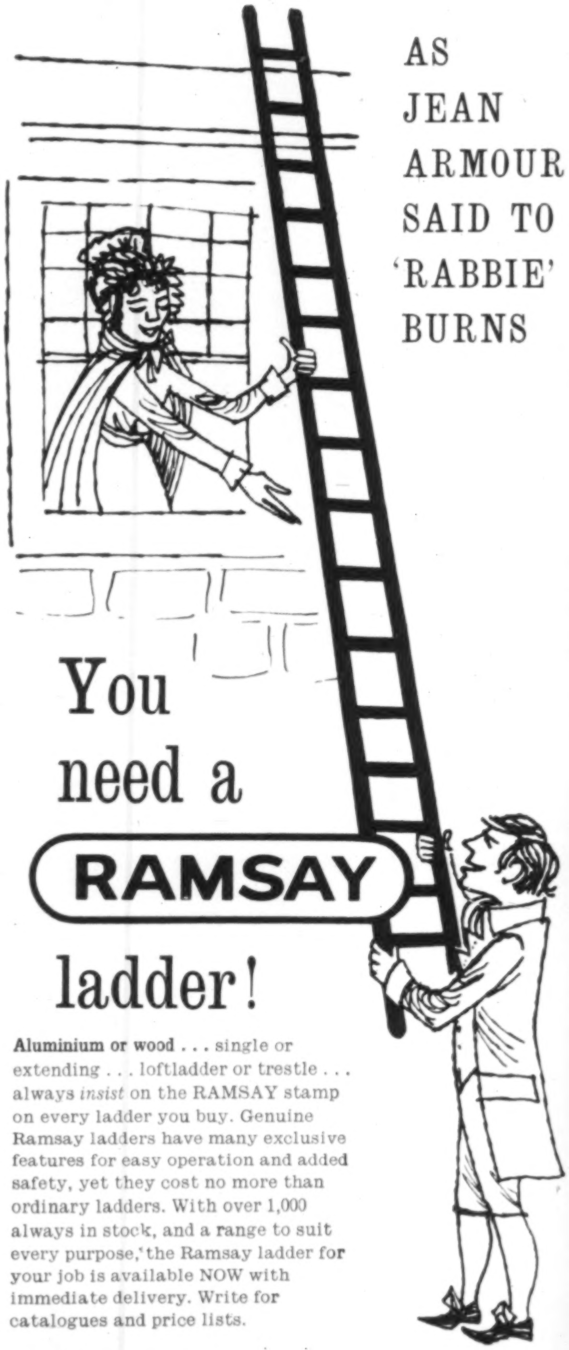

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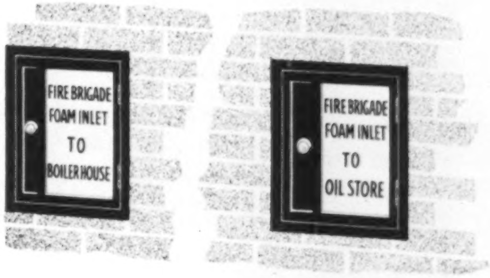

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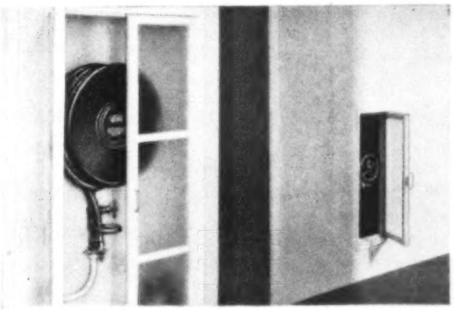

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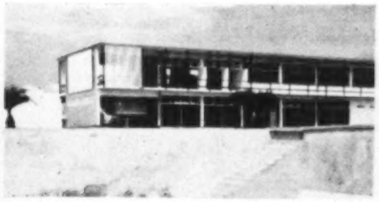

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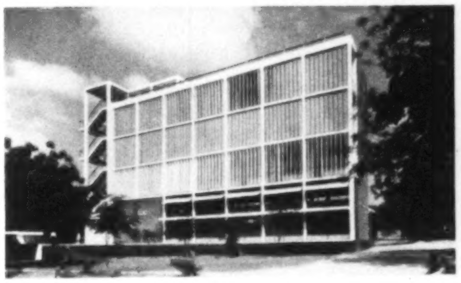

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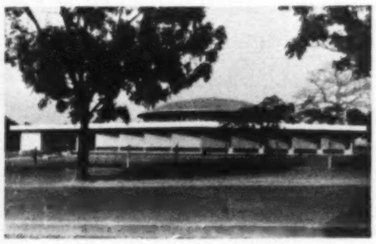

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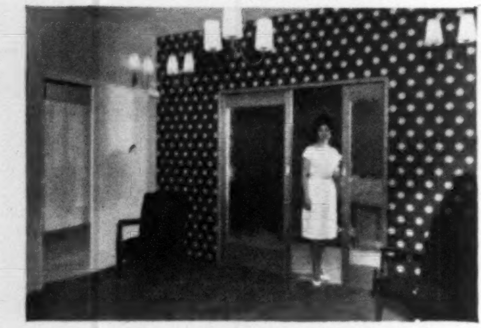

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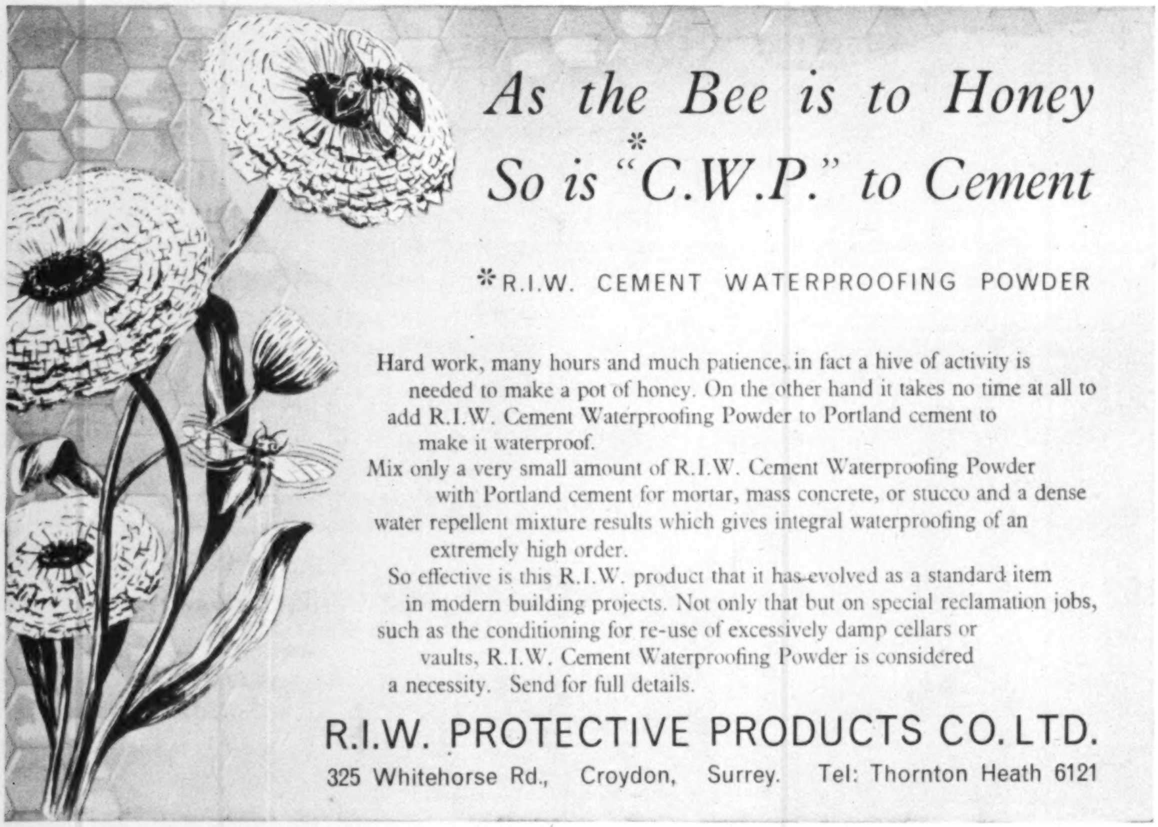

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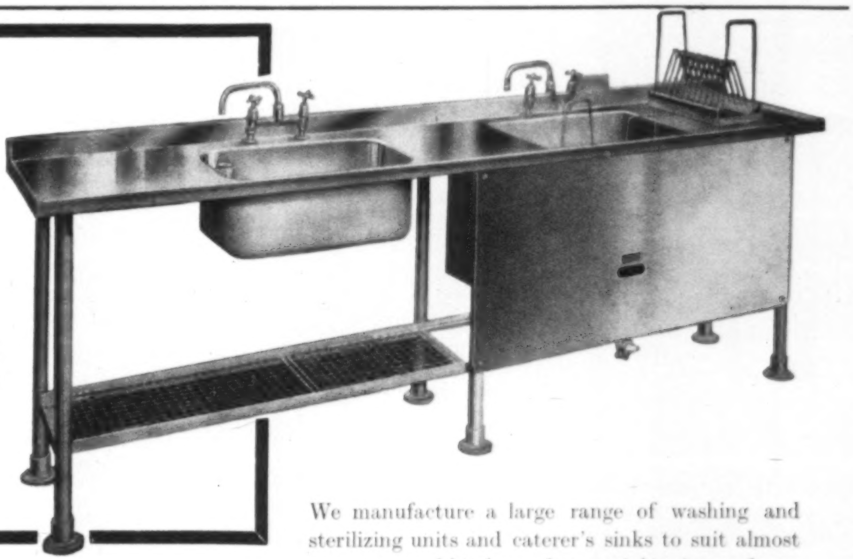

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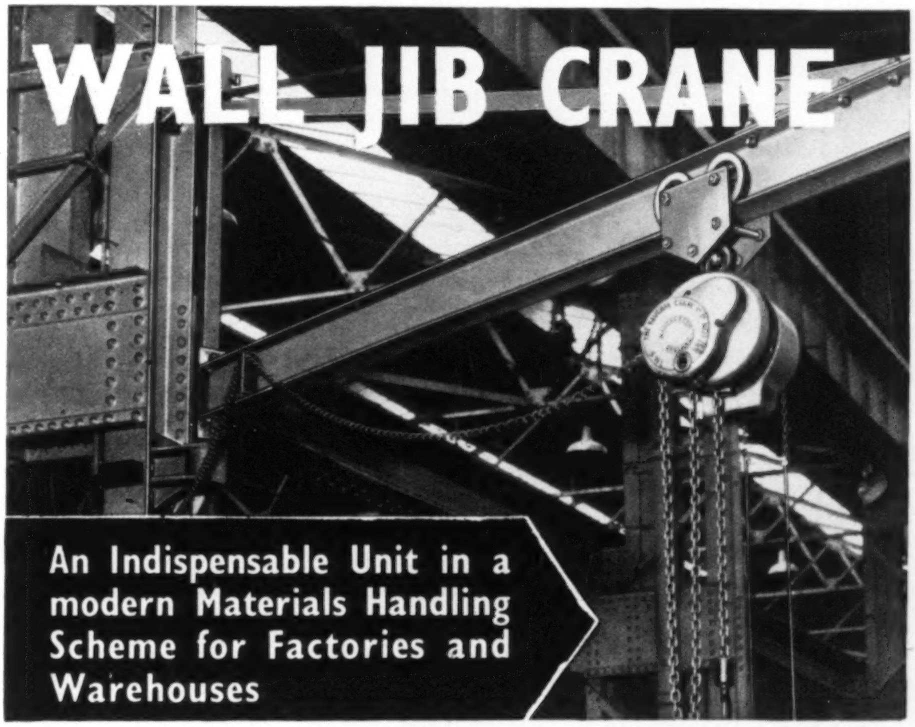
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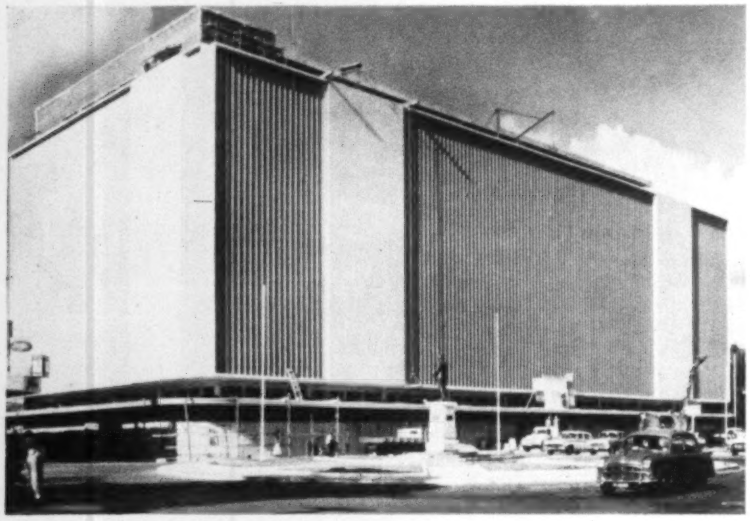

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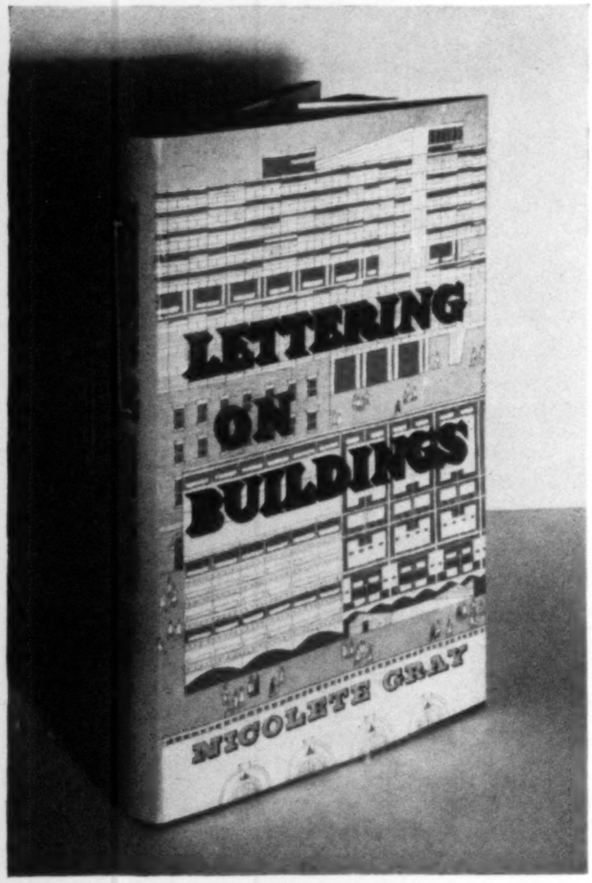

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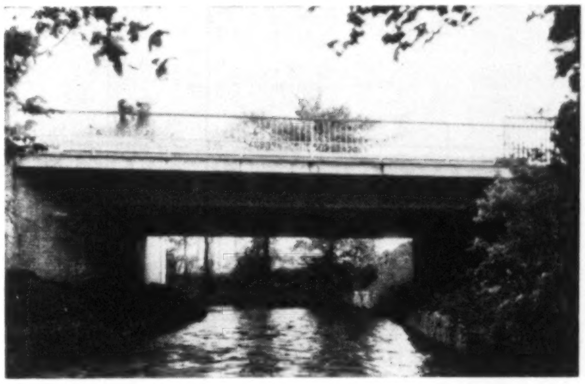

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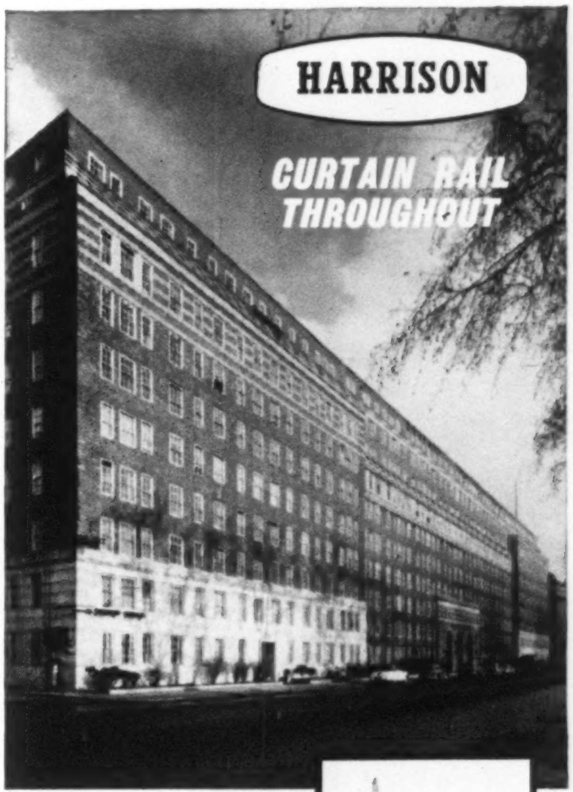

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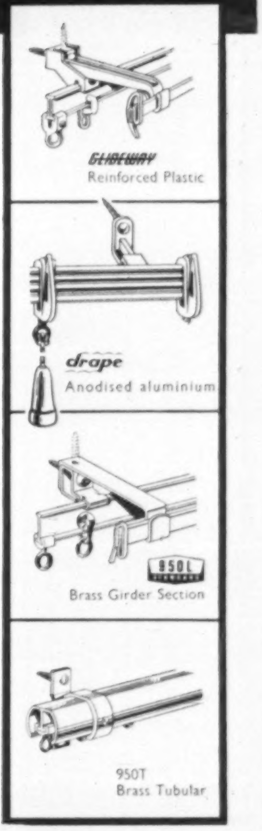

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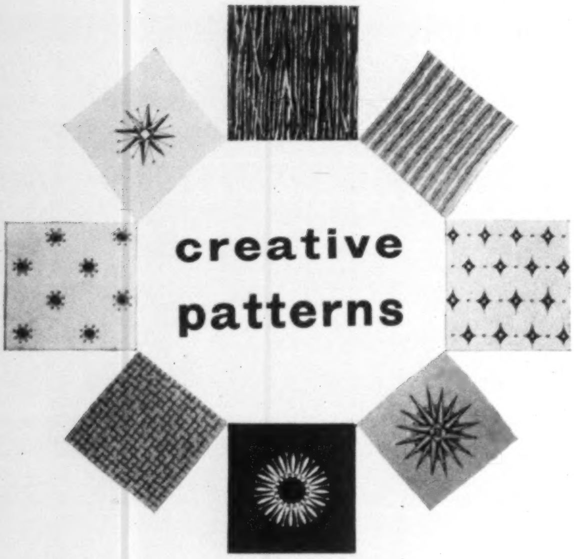

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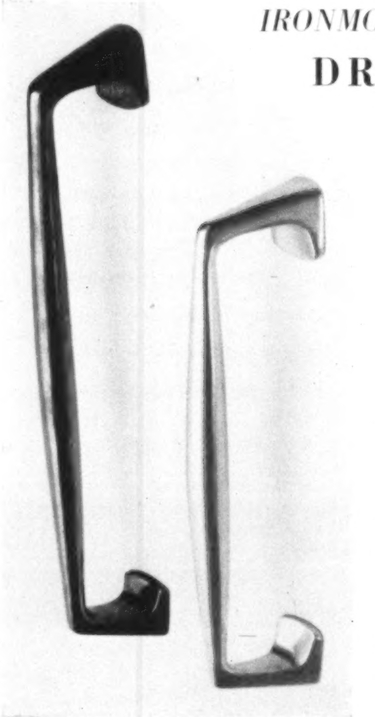

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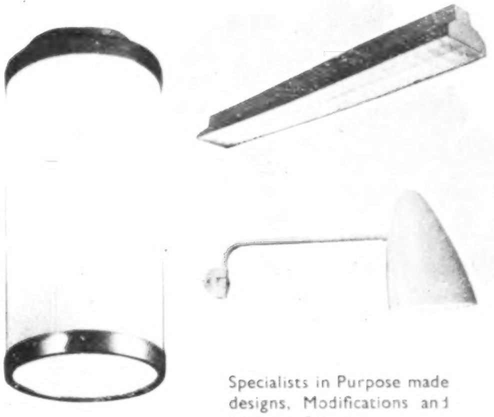

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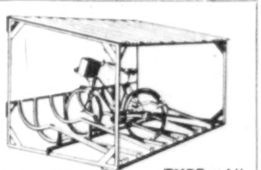

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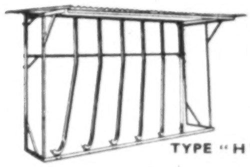

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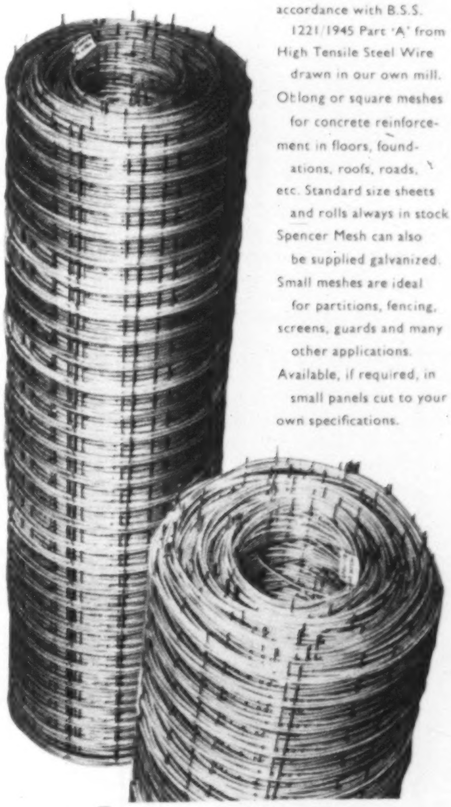

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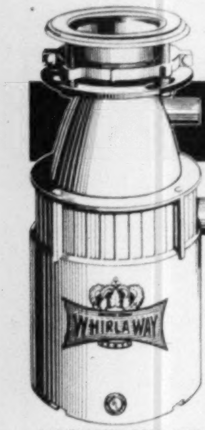

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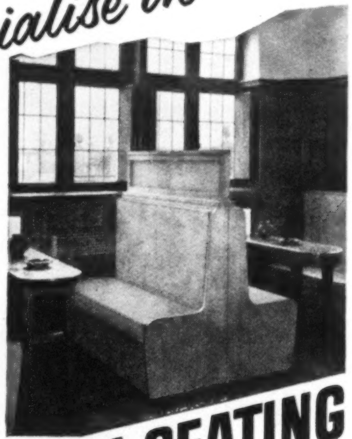

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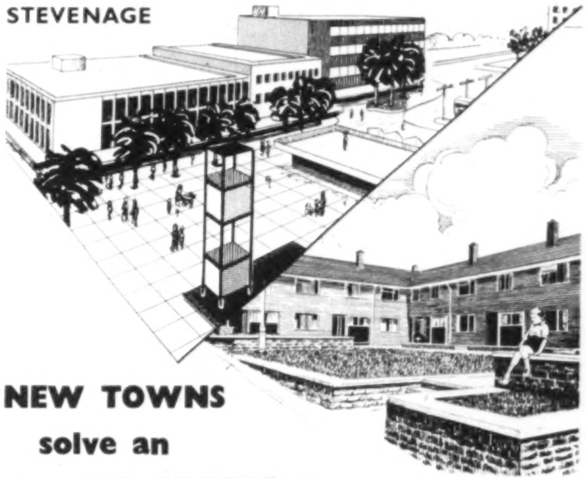

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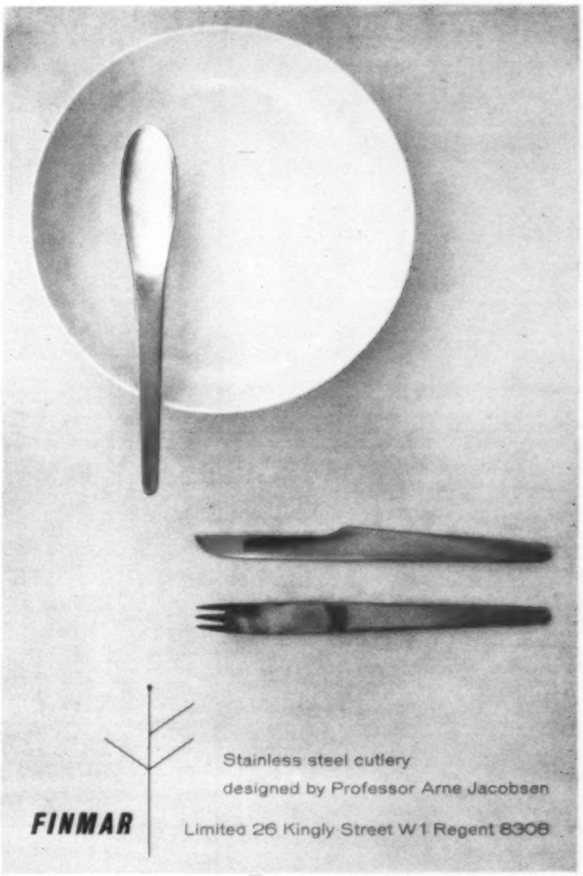

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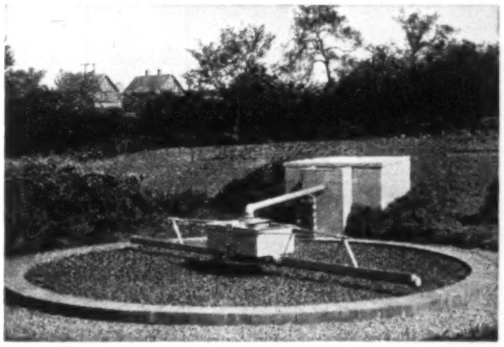

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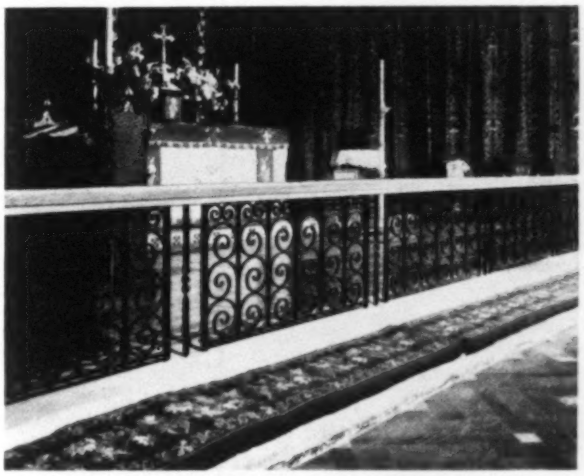

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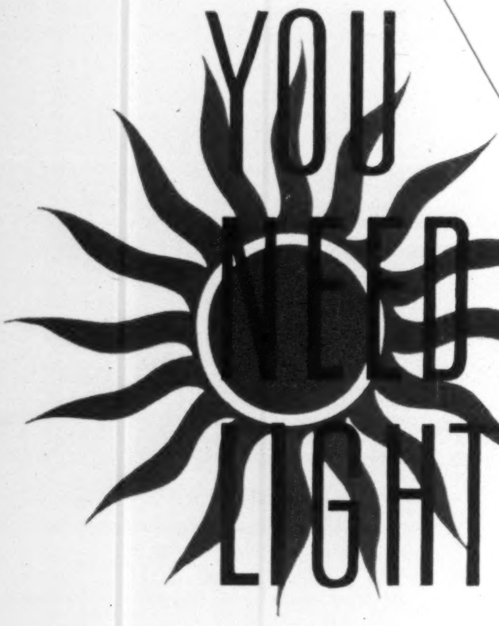

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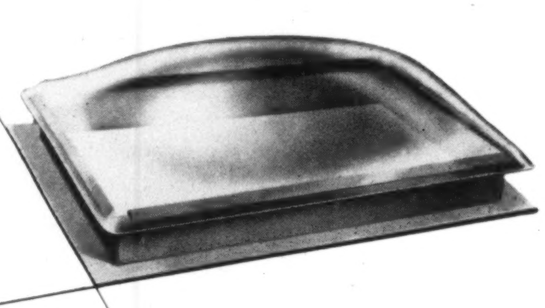

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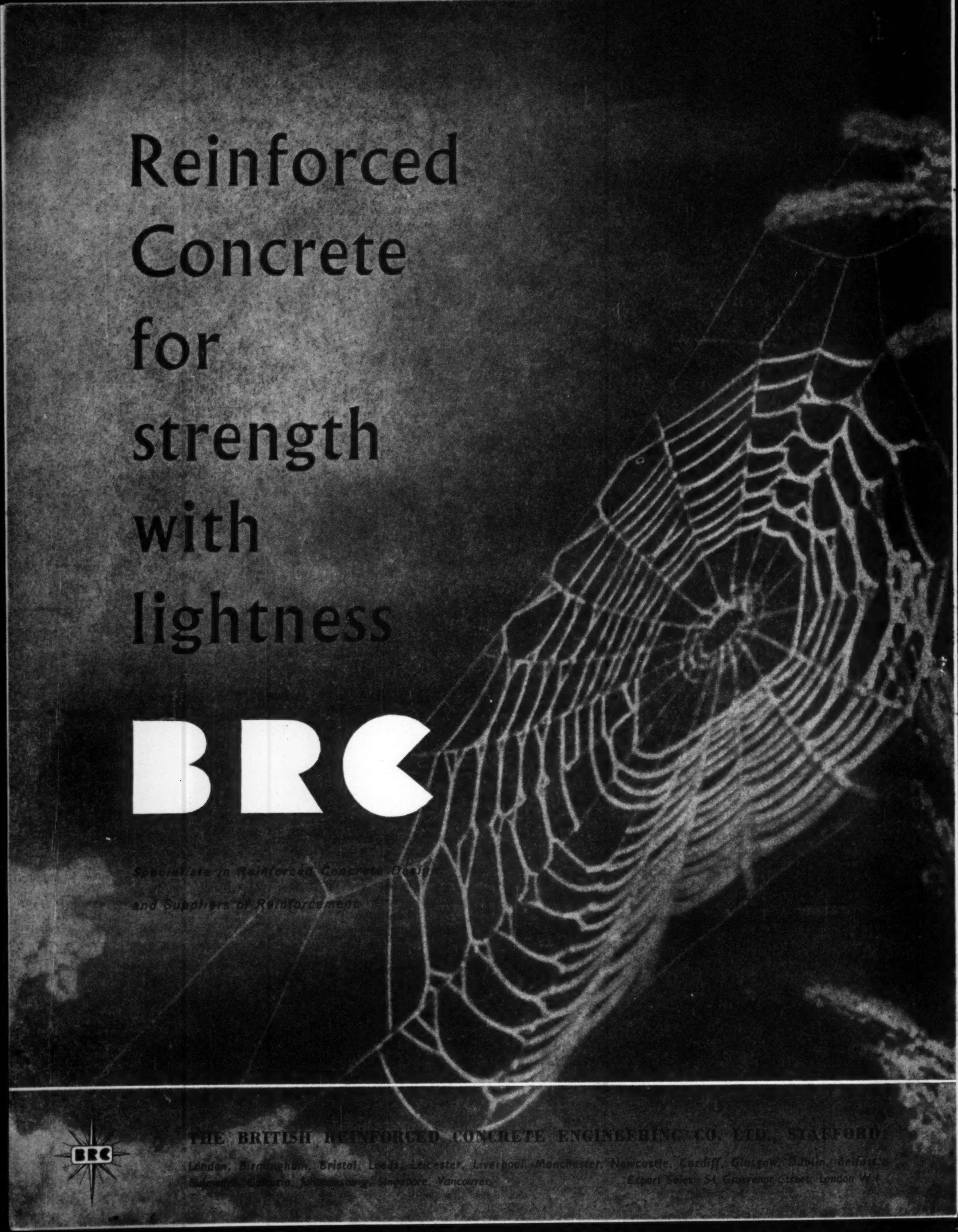
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